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ABSTRACT

Activities to help students in grades 4-6 learn about Kentucky's natural heritage are provided in three sections. Part I offers lesson plans to supplement "Thunder At Middle Ground," a four-part childrens' television series which explores Kentucky's precious natural areas. The four programs focus on the five major natural systems in Kentucky, the deterioration of these systems, thoughtless human impact, and the improvement of environmental quality through individual action. For each program, the handbook provides an introductory quote, a program description, student objectives, and a series of activities. Each activity includes the objective, materials list, notes to teacher, worksheets for duplication, and suggestions for other activities. Part II contains activities to accompany a poster and descriptions of every species of plants and animals (36) on the poster. The final part presents outdoor activities related to soil, microhabitats, ponds, animal behavior, and maps and compass. Background information and resources are in appendices. (DC)

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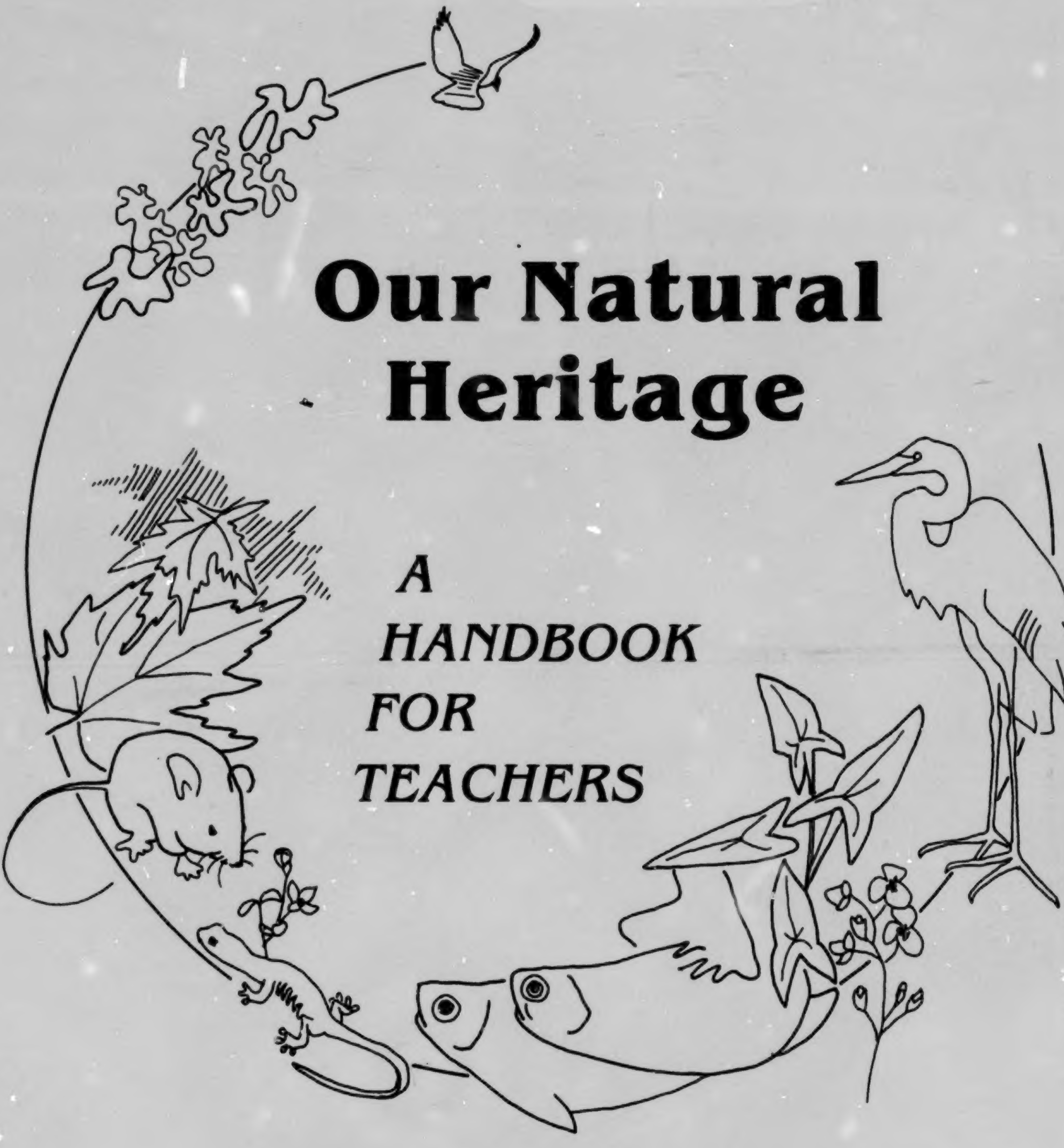
Our Natural Heritage

A HANDBOOK FOR TEACHERS



SE 035 788

OUR NATURAL HERITAGE

A Handbook for Teachers

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This Handbook is jointly sponsored by:

KENTUCKY NATURE PRESERVES COMMISSION

KENTUCKY DEPARTMENT OF EDUCATION
Environmental Education Program

TENNESSEE VALLEY AUTHORITY
Environmental and Energy Education Program

KENTUCKY AUDUBON COUNCIL

September 1981

DEDICATION

SUSANNE L. SCHICK

> "The song of the waters is audible to every ear, but there is other music in these hills, by no means audible to all. To hear even a few notes of it you must know the speech of hills and rivers. Then on a still night, when the campfire is low and the Pleiades have climbed over rimrocks, sit quietly and listen for a wolf to howl, and think hard of everything you have seen and tried to understand. Then you may hear it - a vast pulsing harmony - its score inscribed on a thousand hills, its notes the lives and deaths of plants and animals, its rhythms spanning the seconds and the centuries.
>
> A Sand County Almanac
> Aldo Leopold

In life, Susie heard and understood the pulsing harmony. In death, she is now a part of its score.

Susanne L. Schick, or Susie, as we knew her, was one of the first staff members of the Kentucky Nature Preserves Commission. She came to Kentucky from Chicago, where she was raised with her younger brother, Sammy, by her parents, Armin and Susanne Schick. Her father, a physician and her mother, a fourth grade teacher, had both looked to the natural world for enjoyment. It was only natural for Susie to combine her love of that natural world with her first love, art. She earned her B. S. degree from Earlham College, with a double major in biology and art.

Susie came to Kentucky because she was fascinated with the state's beauty and "Appalachia", and she felt she would have the opportunity to use both her knowledge and artistic abilities. Susie served as artist, photographer, cartographer, display designer and biologist. Her knowledge and concern were always evident, whether she was in the office drawing maps for a report, in the field with the aquatic or terrestrial study teams, or looking for natural areas. Her love of the natural world went into everything she did.

And, that knowledge and concern led to Susie becoming the Environmental Education Coordinator for the Commission. Susie was an effective teacher, instructor and speaker for the Commission. She worked well with teachers and was always enthusiastic about environmental education. She felt it was vitally important to bring people in touch with their natural world.

Susie's dedication to the Commission and the people she worked with, her willingnes to help others, her gentle personality and her love of the natural world were qualities that made it an enormous pleasure to work with her. This Handbook for Teachers is dedicated to Susie with the hope you will enjoy the material and will be inspired to teach your students to appreciate the pulsing harmony of nature.

ACKNOWLEDGMENTS

This Handbook has been designed to accompany the environmental education film, "Thunder at Middle Ground", which will be aired on Kentucky Educational Television in October 1981. Therefore, these acknowledgements include the participants of the film in addition to those who contributed to the fulfillment of the Handbook project and accompanying poster. It is difficult to place the order of importance on an endeavor such as this, simply because every contribution has been important. Further, many persons and organizations gave their assistance out of dedication to educating young minds, others from their concern for the natural world, many of whom we do not know by name. We hope you will recognize your efforts along with the following persons and organizations we wish to thank for their assistance in the publication of this Handbook.

The Handbook has been dedicated to the memory of Susanne L. Schick, a former employee of the Kentucky Nature Preserves Commission. In addition to writing many of the exercises, Sue's art work is found throughout the Handbook.

The children who performed in the film (and thereby provided material for the Handbook) are now known as "The Wash Road Gang". We wish to acknowledge their contributions along with those of their parents: Sharon and Doug Cooley, Heather and Hayden Harker, Lance McKinney, Jeff, Brian, and Steve Morris. In addition, for their performance in the film, we sincerely thank Dr. Roger Barbour, Maggie Buchanan, Jim Carpenter, Ellwood (Bud) Carr, Hal Hamilton, Mrs. Mary Rogers, Pattie Smith, Harry Sparks, Dee and Sam Swain, and Cynthia Yeager.

It is not possible to acknowledge all the places where filming took place; however, staff at the following locations were especially cooperative and we wish to express our thanks to people who assisted us when we visited Land Between the Lakes, Lilley Cornett Woods, Mammoth Cave National Park, Otter Creek Park, and Pine Mountain Settlement School. The following persons allowed us to film on their property and we are grateful to Hal Hamilton, Billy Joe Miles, and Carol Saylor for their cooperation. In addition, for their hospitality and special consideration of our filming efforts, we wish to extend a special thank you to the Goose Lake Prairie State Park, Morris, Illinois, particularly Joe Nyhoff and his staff.

For technical assistance, which included many evening and weekend hours, we thank Lina Barrett, Ellen Demerson, Mindy Faber, Jennifer Reiss, and Don Wells for their filming assistance.

We give special thanks to Alan Barron, who donated his time and talent to produce the "Our Precious Natural Heritage" poster that accompanies this Handbook.

And lastly, to contributing staff members of the sponsoring agencies - the Audubon Council, the Tennessee Valley Authority, the Department of Education and the Kentucky Nature Preserves Commission, a very special thank you.

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INTRODUCTION

Environmental Education is crucial for the simple reason that we do not exist separate from, but as part of, the natural world. To establish in all people an environmental consciousness may very well be the most important accomplishment of modern education.

One might ask, just what is an environmental consciousness? It is a state of awareness about one's existence that provokes consideration of nature. It plays a major role in both everyday and major decisions. There is neither expectation nor desire that everyone will make the same decision given the same question or situation. It is only hoped that any solutions arrived at will include environmental considerations and concern for the future. Thinkers -- these are what we need: people who think before they throw trash on the highway, drive their car, cut down a tree, kill an animal, vote, or buy some type of product. The purpose of an environmental education program, whether taught by a naturalist or in an elementary school, high school, college, or nature center, is to create in people awareness, thoughtfulness, and a sense of wonder about the natural world.

Hopefully, by conveying to your school children that this is their state and their environment, we can all participate in preserving Kentucky, not only for our own enjoyment, but to leave a rightful natural heritage to the next generation of Kentuckians. After all, we are only users of this earth for a short period of time.

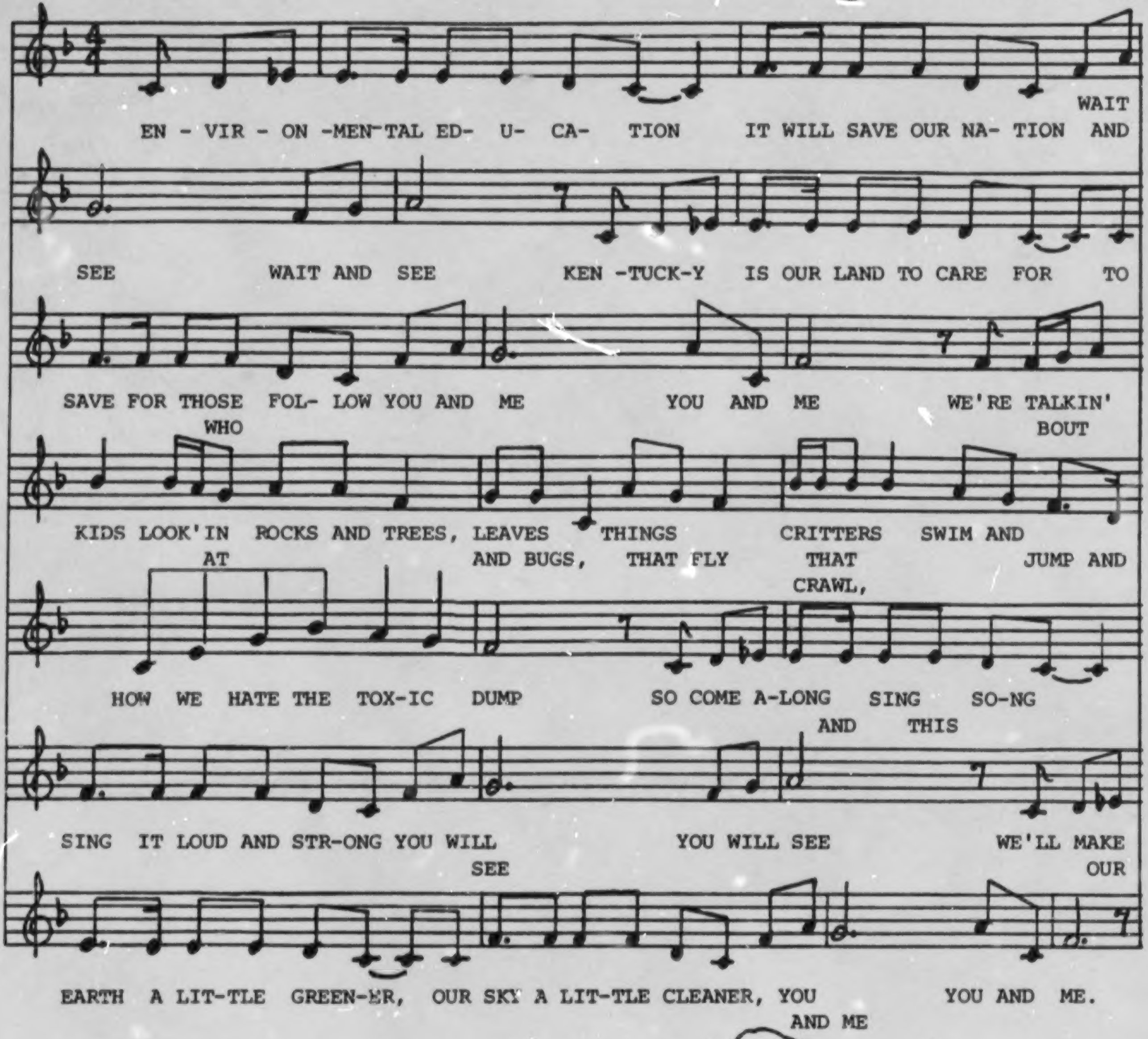
We have a beautiful state, full of natural wonders and rich in natural resources. As Jesse Stuart once said, "If these United States can be called a body, then Kentucky can be called its heart". As we produce energy and food for the entire nation, we must look after our own environment and attempt to leave the earth better than we found it.

This handbook was designed to accompany the Environmental Education Television series "Thunder At Middle Ground", the poster entitled "Our Precious Natural Heritage", and to provide a series of exercises for a meaningful out-of-doors experience. It was projected for use at the fourth, fifth, and sixth grade levels.

The benefactors of this environmental education program will be the children and young adults of today and those they, in turn, touch. We hope you will enjoy these exercises with your school children as you teach and learn about the wonders of our natural world. Your teaching may make all the difference.

WORDS AND MUSIC
BY:
Donald F. Harker
& Van F. Denton

ENVIRONMENTAL EDUCATION

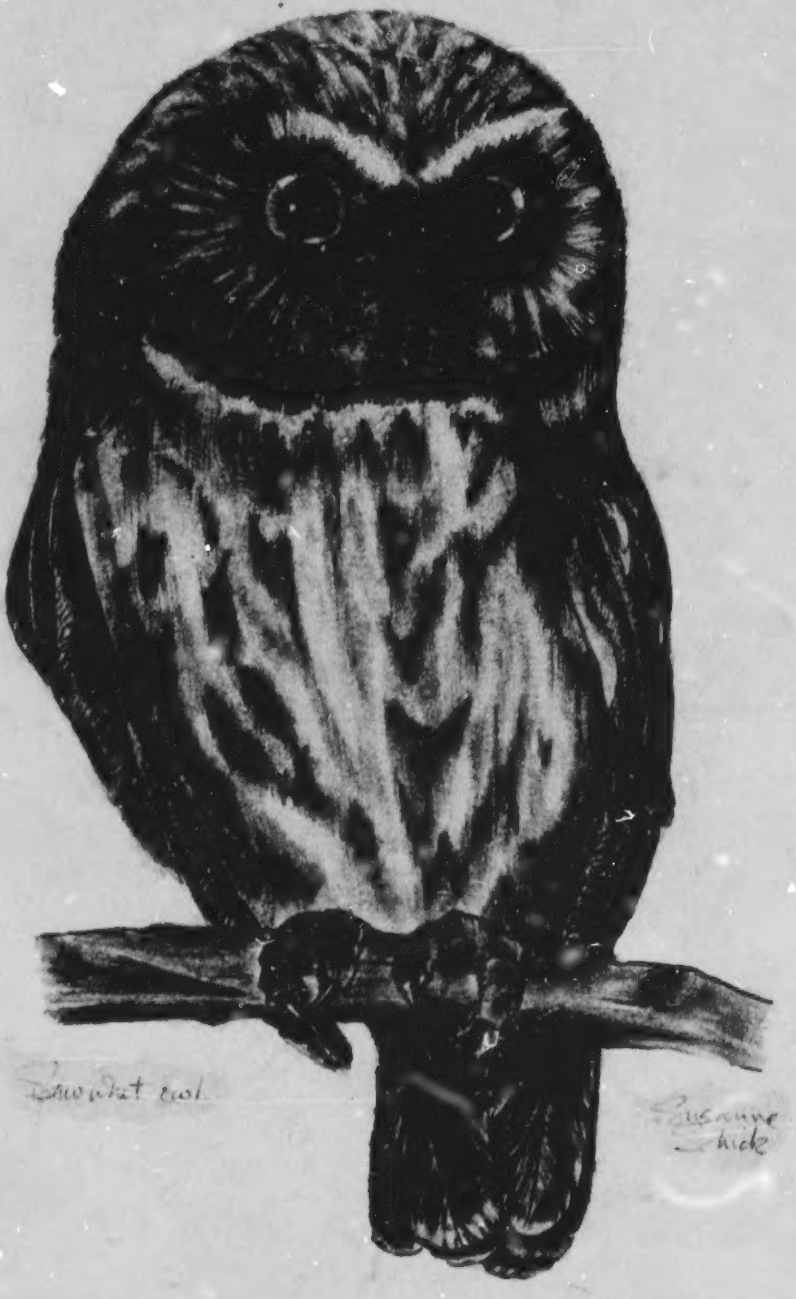

WAIT
EN - VIR - ON -MEN-TAL ED- U- CA- TION IT WILL SAVE OUR NA- TION AND
SEE WAIT AND SEE KEN -TUCK-Y IS OUR LAND TO CARE FOR TO
SAVE FOR THOSE FOL- LOW YOU AND ME YOU AND ME WE'RE TALKIN'
WHO BOUT
KIDS LOOK'IN ROCKS AND TREES, LEAVES THINGS CRITTERS SWIM AND
AT AND BUGS, THAT FLY THAT JUMP AND
CRAWL,
HOW WE HATE THE TOX-IC DUMP SO COME A-LONG SING SO-NG
AND THIS
SING IT LOUD AND STR-ONG YOU WILL YOU WILL SEE WE'LL MAKE
SEE OUR
EARTH A LIT-TLE GREEN-ER, OUR SKY A LIT-TLE CLEANER, YOU YOU AND ME.
AND ME

HOW TO USE THIS HANDBOOK

This handbook is designed for the fourth, fifth and sixth grade levels; however, levels below and above these grades may benefit from certain exercises. Environmental education is based on cumulative experiences. Without a bank of experiences and knowledge, concepts and conclusions about a certain aspect of the ecosystem will mean little or nothing. These sections are written with the intention that they will build upon and reinforce each other. The experience of identifying an insect or noticing the texture of a carpet of moss is as important to a high school student as to a kindergartener. It is hoped that the instructor, by reading the entire section, will be able to determine which experiences are necessary for a full comprehensive experience. How can a student determine what the habitat of a blackside dace is, for example, if they do not know which fish is a blackside dace.

Worksheets, where appropriate, are included with a Key in the Handbook and a master for making copies to be used by the students is included loose in the attachment at the back of this Handbook.

This handbook is not only a source book of activities, but hopefully will inspire new approaches to environmental education. You are encouraged to draw upon your own experience and knowledge in teaching this essential subject.


Sawwhet owl
Susanne Shick

THUNDER AT MIDDLE GROUND

INTRODUCTION

Thunder At Middle Ground is a four part childrens' television series which explores Kentucky's precious natural areas. This series was produced as a cooperative effort between the Kentucky Department of Education and the Kentucky Nature Preserves Commission during the Spring and Summer of 1981. This series is designed to increase environmental awareness for students in Kentucky so they may develop a sense of appreciation and an understanding of the simple natural wonders found in their own backyards.

In the following section there are lesson plans developed to accompany each of the four programs. Thunder At Middle Ground was produced to be used as a supplement for the fourth through sixth grade curriculum. For each program there is an explanation of the storyline and list of student objectives with activities designed to help carry out these objectives. Student worksheets are enclosed in duplicate, appearing in order with each program's lesson plan and in the separate folder in the back of this guide so they can easily be copied. The poster on Kentucky's Rare and Endangered Plants and Animals is to be used along with the program. Also to be duplicated are the enclosed quotes taken from the works of Jesse Stuart. These quotes are provided as another way to introduce each program to your students and as topics for discussion.

Each program begins with a "vignette" which is not directly related to the storyline but gives a special hint of the overall objective for each program's focus. The basic outline for Thunder at Middle Ground is as follows:

First Program - "Journey onto the Middle Ground"

Objective: To explore the five (5) major natural systems found in Kentucky. These are caves, streams and rivers, forests, prairies, and wetlands.

Second Program - "Gathering Thunder"

Objective: To examine the deterioration of the natural systems.

Third Program - "Break In The Storm"

Objective: To show that environmental deterioration is a direct result of thoughtless human impact.

Fourth Program - "Light on the Middle Ground"

Objective: To demonstrate that individual action can help improve environmental quality.

THUNDER AT MIDDLE GROUND

Program I

"Journey onto the Middle Ground"

"Remember stone will crumble, Dirt will loose
An avalanche of Dream in tender spring
To bud and flower into a luscious fruit...
Winter, this Dream will not be anything.
Only your Dream has value and can last,"

"Hold to a Living Dream"
Kentucky is My Land
Jesse Stuart

Program Description:

Vignette:

An animated map traces the recent natural history of Kentucky. Beginning with the last time Kentucky was under an ocean, the map depicts the impact of natural and human forces on the natural systems of the Middle Ground.

Storyline:

While playing, a young girl named Heather is left behind by her friends. Sitting alone in her backyard, she tries to imagine how Kentucky might have appeared in the past. Her daydream becomes startlingly real as she races back through time to the Kentucky covered by an ocean. Then, guided by a mysterious voice, she learns about the prairies, wetlands, waterways, caves, and forests of Kentucky and how they were shaped over the ages. Back in her own yard after the journey, she asks her friends to help her discover if a real forest still survives in Kentucky.

Student Objectives:

Define "Natural Area".

List the 5 major natural systems in Kentucky (see Worksheet I).

On a map of Kentucky, indicate where examples of the 5 major systems could be found.

Prepare a historic timeline of Kentucky.

Write a story about his/her favorite daydream.

Notes to teacher: Various maps of Kentucky, size 8 1/2" x 11" and larger are available at minimal cost from the Department of Commerce, Map Sales, Holmes Street, Frankfort, Kentucky 40601.

Cardinal
Bond

PAGES 6-7 "THE FRONTIERSMAN" DELETED DUE TO COPYRIGHT RESTRICTIONS.

Program I

"Journey onto Middle Ground"

ACTIVITY 2: Natural regions and features

OBJECTIVE: List the five major natural systems in Kentucky and indicate on Kentucky maps, places where they could be found

MATERIALS: Worksheet B, pencils, various maps of Kentucky which show tourist areas, geology, roads, etc.

Using the chalkboard, list with your students the 5 major natural systems in Kentucky that Heather visited on her journey (prairies, wetlands, forests, caves, rivers and streams) and discuss these systems, which are defined on Worksheet B. Using maps of Kentucky, have students draw the areas where these 5 major natural systems can still be found. Be sure to emphasize natural systems which are located near your community. Using Worksheet C, identify the geographic regions of the state which are:

1. Bluegrass
2. Knobs
3. Appalachian Plateaus (Eastern Coal Field)
4. Mississippi Plateau
5. Shawnee Hills (Western Coal Field)
6. Coastal Plain (Jackson Purchase)

Have students draw or write on the map where they think these natural systems might exist today. Of example, some major cave systems are located in the Mississipi Plateau (Mammoth Cave); forests can be found in the mountains of eastern Kentucky.

For Further Activity

Materials Needed: Paper, salt, flour, oil, tempra paint

Have your students divide into small groups. Using the materials needed for each group, have students make a salt map (see ingredients on next page) of Kentucky emphasizing the natural features of the state. Be sure to include the following features:

Falls of the Ohio
Mountains of Eastern Kentucky
Kentucky River
Ohio River
Cumberland River (and Falls)
Land Between the Lakes
Daniel Boone National Forest (Emphasize Red River Gorge)

(more)

Wetlands (i.e., Henderson area and Coastal Plain)
Mammoth Cave Area
Natural Arch Areas (McCreary County, Red River Gorge)
Bluegrass Region (prairies extended into Bluegrass south to Barren and Logan counties)

SALT MAP: 6 cups flour, 1 1/2 cup salt, 3/4 cup oil. Mix ingredients well. For color, add tempera paint. Add enough water to make consistency of pie dough. Have students form dough map on heavy cardboard.

NOTE: Please emphasize to your students that cave systems in Kentucky are found only in limestone regions. Wetland areas occur minimally in various regions of Kentucky, whereas prairies are almost non-existent. Once plentiful and located primarily in central and southern Kentucky, today there are only 3-4 known remnants of these prairies.

WORKSHEET B (Program I, Activity 2)

PRAIRIES

A typical prairie is a large area of level or slightly rolling land with generally deep fertile soil and tall grasses. Few trees grow on a true prairie. A hill prairie, on the other hand, is dominated by similar species but has thin, rocky soil and is generally found on steep hillside slopes.

WETLANDS

A wetland is an area in which the water table is at or near the soil surface, and standing water is typically present for at least some portion of the year. The characteristically saturated soils of a wetland support aquatic plants adapted to this wet environment. Bogs, marshes, and swamps are all examples of wetlands.

FORESTS

A forest is usually a large area containing closely spaced trees and underbrush. If the trees are mostly pines, the area is a pine forest; if oak, then it is an oak forest, etc.

CAVES

A cave is a natural underground chamber or passageway opening to the surface and formed by rock faulting, subsurface erosion, or subsurface dissolution of limestone or soluble rock.

RIVERS AND STREAMS

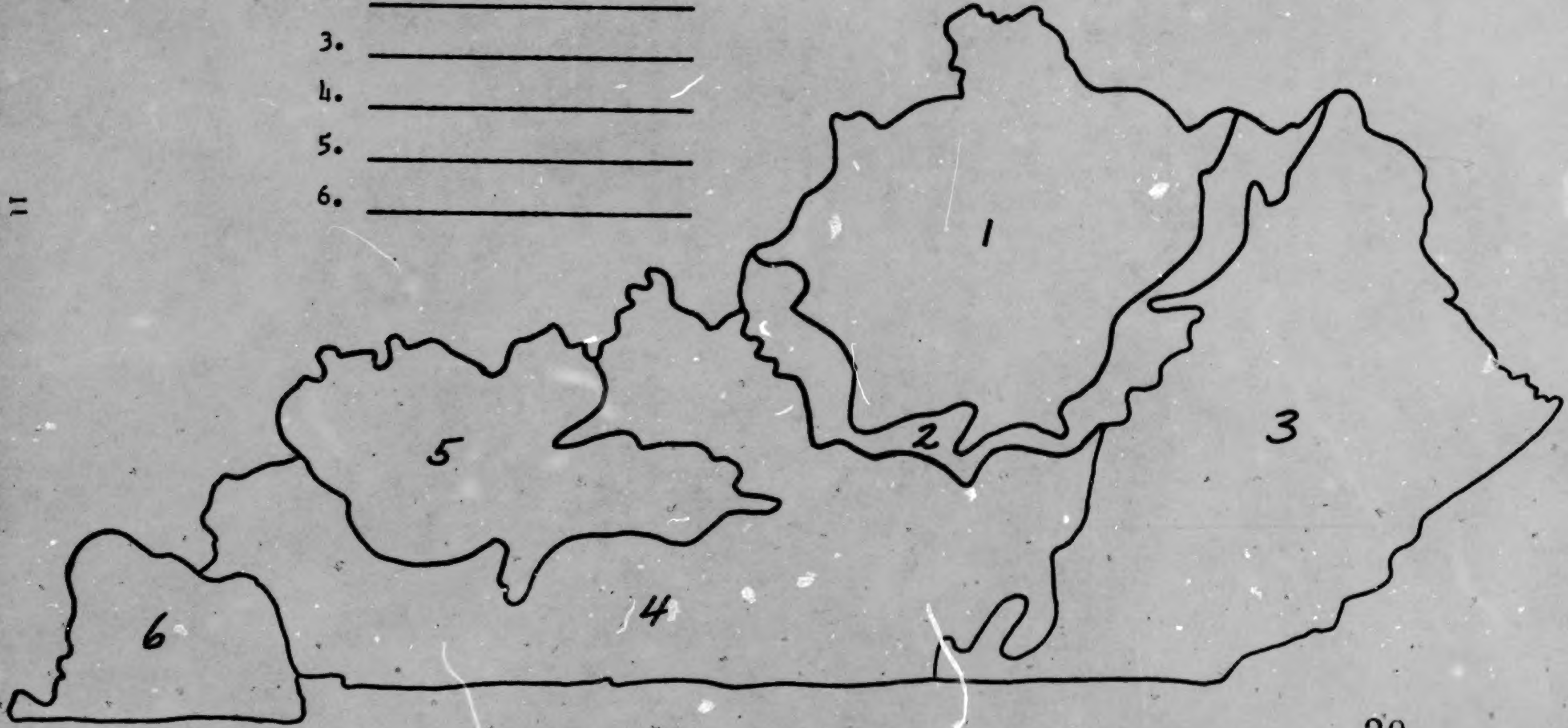
A stream is a body of running water flowing in or on the earth's surface. Streams may have a constant supply of water. Rivers, creeks, and branches are examples of streams.

WORKSHEET C

Match correct number of geographic region to the corresponding name. When you have finished, draw or write places in these regions where you might find prairies, wetlands, forests, caves, or rivers and streams.

REGIONS OF KENTUCKY

1. ____________________
2. ____________________
3. ____________________
4. ____________________
5. ____________________
6. ____________________



"Journey onto Middle Ground"

ACTIVITY 3: A Bicentennial View

OBJECTIVE: Write a paragraph which describes what the area around your school may have looked like 200 years ago.

MATERIALS: Pencil and paper

By now you and your students should be somewhat familiar with what natural systems in Kentucky are like and where they exist. Have your students go outside and pick a "quiet spot" somewhere on the school grounds. Encourage them to listen quietly to the natural sounds (you may want to reread the passage from The Frontiersman). Tell each student to imagine themselves in a time capsule that takes them back 300 years. Have them describe in their paragraph what they think their "quiet spot" might have looked like 300 years ago. When everyone has finished, exchange the ideas the students have imagined. Did they see any of the same kinds of places that Heather saw in her journey?

ACTIVITY 4: The Time Tape

OBJECTIVE: Prepare a historic timeline of Kentucky

MATERIALS: Several meter sticks, pencils, Worksheet D

NOTE: You may want to do this activity as a large group depending upon your students' math skills.

Obtain a 1-meter (100 cm) length of adding machine tape. The length of the paper is to represent 1,000 years. Since 1,000 mm (millimeters) equals 1 meter, each millimeter represents a year. Let the right end of the tape represent the present time. Measure a distance back from the present which represents the birth year of one of the students. Mark this spot and label it Birth of (student's name).

Using Worksheet D have students find the place on their timeline which corresponds to a Kentucky event. Mark each spot. Be sure to have students draw illustrations on the timelines which correspond to the correct event. After students mark their timeline back to 1654, discuss with them what events took place in Kentucky before that time. How can we tell what happened before 1654?

Since there is very little recorded history available before 1654, have students illustrate on the rest of the tape the 5 different types of natural systems in Kentucky. Be sure to have them include Indian interaction and presence in Kentucky.

For teacher information:

Prior to recent Indian history in Kentucky, there is evidence of very primitive tribes of people, "The Mound-Builders", who lived in the state. The records show their settlement here occurred several thousand years ago. There was no recent settlement of Indian tribes when Kentucky was settled by European and African settlers. Major Indian settlements were located around the border of the state in Ohio, Missouri, Tennessee, and Arkansas. The various tribes on these borders came to Kentucky to hunt and fish, and many bloody Indian battles were fought over control of the rich hunting land found here. The various Indian nations who fought for this "middle ground" they called Kentucky were outraged when frontiersmen took over the area that had given them their subsistence. Hence, there were many Indian attacks on frontiersmen and pioneers in the early years of settlement.

WORKSHEET D (Program I, Activity 4)

Recorded History of Kentucky - European/African Settlers

1976	Kentucky Nature Preserves Commission created
1972	Environmental education becomes a mandated program for Kentucky schools
1965	Kentucky celebrates 3 billionth ton of coal mined in the state
1962	Kentucky wins "Keep America Beautiful" Award
1937	Worst Ohio River flood in history
1924	First State Park established
1875	First Kentucky Derby
1862	Battle of Perryville
1832	First Railroad operated in Kentucky
1818	Jackson Purchase adds Western Kentucky
1811	Strong earthquake hits Kentucky; Reelfoot Lake is formed
1809	Abe Lincoln born near Hodgenville
1799	Mammoth Cave discovered
1792	Kentucky gains statehood
1778	Louisville founded
1777	Indian attacks leave Kentucky almost desolate
1776	Kentucky organized as a Virginia County
1769	Daniel Boone first visits Kentucky
1739	M. Longueil discovers Big Bone Lick
1654	Colonel Wood explores Kentucky

THUNDER AT MIDDLE GROUND

Program II

"Gathering Thunder"

"And then to think each comes and takes his turn.
Each man's a god and each is crucified.
Each goes back to the dirt and grass and fern
After the temple of his flesh has died.
Each comes and goes and each must go alone;
Each life is dirt and time and rhyme and stone.

Man with a Bull Tongued Plow
Jesse Stuart

Program Description

Vignette:

The downstream journey of a large magnolia leaf is intercut with a bizzare dance created by man's indifference to his environment.

Storyline:

Heather and her friends begin their search for a forest. They come to a small stream in which they find a large leaf that is so large they believe it must have come from a real forest. The children follow the stream - searching for the tree - and as they search they come across horrible scenes showing the impact of raw sewage and trash. Where this human impact has choked the life of plants and animals, they find grave markers naming species no longer found in Kentucky. As they follow the stream toward its source, they begin to notice a change - the crispness of air - the flourish of trees making soft green reflections on crystal water. Stopped by the sight of a pile of grave markers, they are surprised when a woods woman appears and begins hiding the markers. She looks up from her task of saving these endangered species and silently motions the children to follow her. Hesitantly, they quietly follow her into the woods where she shows them how to explore the forest using all their senses.

Student Objectives

Identify components of an ecosystem
Trace the steps of a water cycle
Distinguish between the terms "endangered", "extirpated", and "extinct"
List one endangered plant and animal found in Kentucky.
Define "pollution"
Compare and contrast ways to improve a polluted area in the community.
Demonstrate ways to explore the out-of-doors using the five senses.

Program II

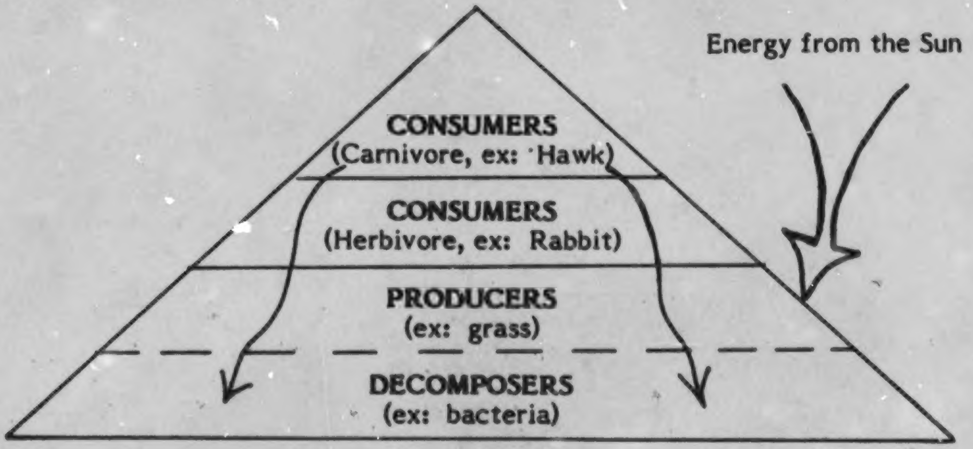
"Gathering Thunder"

ACTIVITY 1: The Ecosystem

OBJECTIVE: Identify components of an ecosystem

MATERIALS: Paper and pencil

Ask your students to imagine that each one of them has 100 acres of free space and on this one hundred acres, they are to build a forest. Ask each student to make a list of what ingredients they would need to make 100 acres of forest. "To make a forest I would need..." While the students are writing their ingredients down draw a large pyramid on the board like the one below.



When the students have finished, have them give you their ingredients as you write each ingredient in the proper portion of the pyramid. If students have some ingredients that would not fit the pyramid, write it on the board to the side. When your class has finished listing some of their ingredients, go over the definitions of a consumer, producer, and decomposer.

Decomposer	Organisms which eat and break down dead plants and animals and return them as organic matter to the soil, i.e., bacteria, micro-organisms.
Producers	Plants which take inert ingredients and make food. This would include all green plants. Some of the ingredients they need are: carbon dioxide + water + chlorophyll (green stuff in plants) + energy from the sun = starch + sugar + oxygen.
Consumers	Animals which eat plants (this of course includes humans). You could split this category into animals that eat plants, animals that eat animals and animals that eat both plants and animals, but basically all animals must have plants to survive).

(more)

Go over the inorganic ingredients that make up soil - these might include the ones you listed which did not fit the pyramid.

For Further Activity

The pyramid Game:

Go outside with your class and have them build a human pyramid which illustrates the pyramid you drew on the board. (Deomposers on the bottom, plants in middle, animals on top). Discuss what would happen if you pulled out a decomposer. Where does the sun belong?

Program II

"Gathering Thunder"

ACTIVITY 2: The Water Cycle

OBJECTIVE: Trace the steps of a water cycle.

MATERIALS: Worksheet E, Large Newsprint, markers

Read Worksheet E with your students. Ask and discuss if they have ever been in a cave, and what their experiences and feelings are concerning caves. What are sink holes? Why are there so many caves in Kentucky? Why is it important that cave systems and sink holes are kept clean? Stress to your students that cave systems act as the "collecting pot" for our water. As it rains, water seeps through the ground and collects in underground caverns. The cave systems help to filter our water and make it clean as the water seeps through the limestone rock. If people dump harmful chemicals into sinks and streams or the water becomes too stagnant, the underground water supplies cannot be filtered properly.

Using maps from local resource people in your area such as a soil conservation agent, water plant personnel, etc., trace your school's water supply. Begin at a sink or toilet and make a large classroom diagram of where your water supply begins and ends! You might want to cover one wall of your classroom with shelf paper and have students illustrate the diagram. You will soon find that you have a global map! Stress the significance of how we all must use the same water and the care we must take to insure our water supplies are clean and not wasted.

For Further Activity

Take a trip to some of the public guided cave tours in Kentucky. Ask your cave guide to relate the importance of the water cycle to your students. NOTE: Some school groups take overnight trips to wild caves in our state. Proper safety and cave knowledge are a must in this endeavor. If you would like more information regarding this possibility contact: Environmental Education Co-ordinator, Room 1829, Capital Plaza Tower, Frankfort, Kentucky 40601.

PAGE 19 "KENTUCKY THE STRANGE LAND" FROM SIMON KENTON, REMOVED DUE TO COPYRIGHT RESTRICTIONS.

Program II

"Gathering Thunder"

ACTIVITY 3: Going, Going, Gone

OBJECTIVE: Distinguish between the terms "endangered", "extirpated", and "extinct". List one endangered plant and animal found in Kentucky.

MATERIALS: Worksheet F, pencils

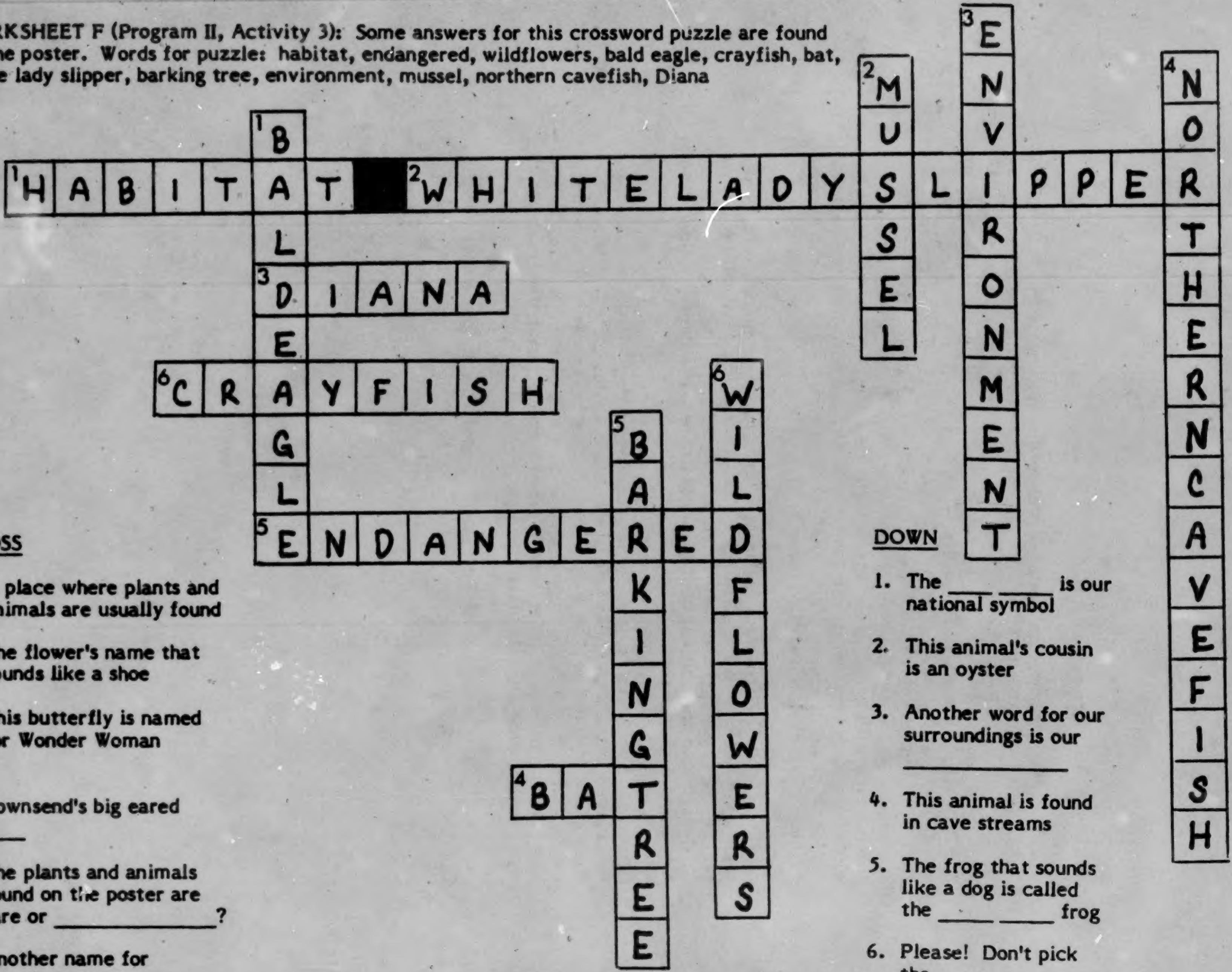
Put the three words "endangered", "extirpated", and "extinct" on the board. Ask the students what they think the difference is between the three words. Write all their answers on the board. After discussing the difference between the three, have them list animals that are extinct. (Refer to passenger pigeon, dinosaurs, etc.) Why did these animals become extinct? (List their answers on the board.)

Discuss the term "extirpated" in terms of a specific geographic region, e.g., county, state. A species of plant or animal that did occur in a region and is now gone is considered extirpated from that area. You can further go into the concept that we must define our universe (in our case, Kentucky), and care for it.

Now discuss the term "endangered". What animals are endangered in the world? Whales, elephants, manatees, etc. How about in Kentucky? (Refer to the poster on endangered plants and animals in Kentucky.) In the television program, when Heather and her friends were going up the creek, why were there grave markers along the creek bank? What caused these animals to die?

Have students do Worksheet F, referring to the poster to help find the answers.

WORKSHEET F (Program II, Activity 3): Some answers for this crossword puzzle are found on the poster. Words for puzzle: habitat, endangered, wildflowers, bald eagle, crayfish, bat, white lady slipper, barking tree, environment, mussel, northern cavefish, Diana


1 HABITAT
2 WHITELADYSLIPPER
3 DIANA
6 CRAYFISH
5 ENDANGERED
4 BAT
1 BALDEAGLE
2 MUSSEL
3 ENVIRONMENT
4 NORTHERNCAVEFISH
5 BARKINGTREE
6 WILDFLOWERS

ACROSS

1. A place where plants and animals are usually found
2. The flower's name that sounds like a shoe
3. This butterfly is named for Wonder Woman
4. Townsend's big eared ____
5. The plants and animals found on the poster are rare or ______________?
6. Another name for crawdad

DOWN

1. The ____ _____ is our national symbol
2. This animal's cousin is an oyster
3. Another word for our surroundings is our ______________
4. This animal is found in cave streams
5. The frog that sounds like a dog is called the _____ _____ frog
6. Please! Don't pick the ______________

Program II

"Gathering of Thunder"

ACTIVITY 4: Don't Pollute

OBJECTIVE: Define "Pollution". Compare and constrast ways to improve a polluted area in the community.

MATERIALS: Pencil, paper, Worksheet G

Discuss with your students the various things that Heather and her friends saw as they walked up the stream in search of the forest. What were the reactions of your class when they saw oily goop choking the stream and litter piled along the bank? After the students have expressed their feelings about pollution, pass out Worksheet G and have your students carry out the suggested activity.

For Further investigation:

Fish Eye View of an Oil Spill (taken from Language Arts with an Environmental Twang, Miriam Litchfield, Center for Environmental Education, Murray State University, 1979.

Take the students outside. Give each group of 5-6 a pan filled with water and a bag or two of absorbent matrials (e.g., cotton, newspaper, sawdust, wood chips, string, corn meal). Now pour motor oil on top of the water. Challenge them to clean up the "oil spill." Dip a feather into the oil and ask them to clean the feather too.

After fifteen minutes, each group reports on its progress. Most will feel fairly unsuccessful. Talk about the problems they had. Discuss major oil spills and the problems associated with them. What happens to wildlife when an oil spill occurs? Why?

Assign creative writing topics. Example: Students take on the identity of fish or ducks and write about the oil spill from that particular vantage point.

WORKSHEET G (Program II, Activity 4)

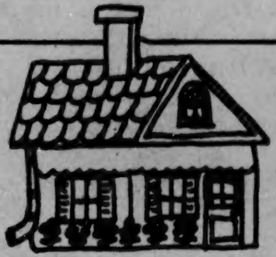
GLUT UNGLUT

A glut is someone who pollutes without thinking. Most of us are gluts at one time or another. Discuss glut-type behavior and ways to overcome it. Have small groups of students pantomine Mr. and Mrs. Average and their children in the following situations as they (1) show glut-type behavior and (2) choose a pollution-wise alternative. Make masks for the characters to wear or let them use puppets. The rest of the class guesses the activity in each scene. Encourage the students to think up new situations of their own.

Mrs. Average keeps her house very clean.

GLUT: She uses many paper towels.

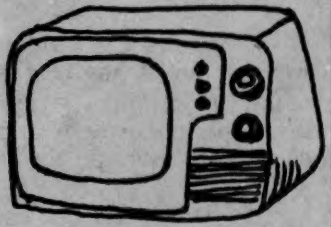
UNGLUT: She makes a rag bag and fills it with old clothes, towels, and sheets.



Sister Sue is watching television.

GLUT: She goes outside to play and leaves the television on.

UNGLUT: She remembers to turn the set off before she leaves the room.



Brother Ben is taking a shower.

GLUT: He uses gallons and gallons of water.

UNGLUT: He runs enough water to get wet, soaps his body, and turns the water on again to rinse off.

(Glut examples come from Fun With the Environment, a free publication of the Environmental Protection Agency, Washington, D.C. 20460. The suggested activity comes from Language Arts With An Environmental Twang, Miriam Litchfield, Center for Environmental Education, Murray State University.

Program II

"Gathering Thunder"

ACTIVITY 5: Indian Soft Walk

OBJECTIVE: To communicate the special magic found in silence and to help children become atuned to the gentle voice of the earth and its creatures.

MATERIALS: Worksheet H

Note to Teacher: The Indian Soft Walk can be divided into three distinct parts: the walk, the sharing blanket, and the listening-discussion. All three parts can be used independent of one another.

Although I will share with you the way I conduct this program, it is my hope that you will not feel compelled to follow my "formula". Especially, I hope that you will not be intimidated by the wild foods and natural materials that I use. If these objects are not available, other objects of interest can be used. Even an urbun environment can provide you with "treasures from the earth". Train your eyes to see the value and beauty of the sometimes overlooked weeds, seeds and tiny creatures. Under the magical spell of silence, a snail moving slowly across a leaf speaks for itself - proclaiming to all who will listen that life is rich in beauty and mystery.

Pattie Smith
Naturalist - Otter Creek Park

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WORKSHEET H (Program II, Activity 5)

The Walk

When we hike, not only will we move quitely but we will respect that invisible space that surrounds each person, being careful not to step on the heels of those in front of us. To the Indians silence was the giver of great powers and the "cornerstone to character". Like the Indians, we want to capture a reverence for silence by taking a soft walk - a walk where there will be no talking, our movements will be as soft as possible. When we see something interesting, instead of shouting "Look"! we will motion with sign language. We will end the walk with a sharing blanket.

Moving along the path we come to a pond where there are cattails. I motion for the group to gather around. I pull up a young shoot, peel off the outer sheath and take a bite of the tender inner shoot. I motion that it is good and invite others to taste it. Of course, you must be knowledgeable about which wild foods are edible and which are not. Then, I take a blade of the cattail and split it into 3 equal lengths with my thumb nail. I tie a knot at the end and place the knotted end in my mouth and braid it, making a headband, and place it on a student's head - all of this is done in silence. Moving along the trail I keep my eyes open for things to share such as some deer tracks to point out, which I do by placing my palms at side of my head with fingers extending outward.

Sharing Blanket

A small clearing in the forest can serve as the "sharing blanket". I motion that we form a circle and sit down. I share the interesting things I have collected on the walk, such as Jewelweed - whose seed pods pop open, throwing their seeds, when touched. I might have poke berries to use for painting noses, or the sleeping coccoon of a caterpiller. A special treat might include ripened persimmons and sassafrass tea and sumac ade with a sign language demonstration of how to make it. Of course, treasures gathered from the walk will change as the seasons change. I may pull from my basket the wing of a hawk, showing how it could be used as a fan, a hollow gourd to use as a dipper. I might have a basket made of honeysuckle vines filled with wild foods that are in season. I pass the objects around and when they are returned, I hold up a clean paper plate, and begin to "paint" a picture on the plate with colorful flowers, berries, leaves and mud which I have collected. Upon completing this project, I begin to move around the circle and paint the children's faces with berries or mud. After this I return to my place. For the next five or ten minutes we sit still and listen to the sounds around us. Finally I break the silence by speaking. I explain that it is very difficult to break the silence, that whenever a group of people can come together and sit quietly and listen, it makes a very special kind of music. It's the music of the forest and of the fields. It's a kind of music that the Indians knew about long ago. It's called silence.

WORKSHEET H (continued)

I ask the children "What did you hear? Name one sound at a time. Was it music or was it noise? Most natural sounds, the wind in the trees, the birds, the crickets, all sound like music. The cars, jets, lawn mowers sound like noise. I ask "How do you suppose we sound to the animals, like music or noise"? Probably we sound like noise. Do you suppose that is why they run and hide when they hear humans coming through the woods? Perhaps we need to turn down our noise so that we too sound like the music of the forest and fields. And like the Indian, learn more of their secrets.

Optional Follow-up

1. Give each child a paper plate so that they too can collect "nature paints" and make their own picture.

2. For older children (6th grade and up) have them look for a natural object that symbolizes something within themselves, either how they relate to the land or to other people. Give them five minutes to silently find such an object and bring it back to the sharing blanket where they can share verbally with the others why they chose the object.

Suggestions:

After completing the soft walk you may wish to discuss the fact that the Indians knew that everything they had came from the earth. Discuss how everything we have comes from the earth as well, but that sometimes we forget because we obtain our needs from the store. How does this effect our "environmental consciousness"?

THUNDER AT MIDDLE GROUND

Program III

"Break in the Storm"

"I do not understand
Infinite wisdom of this workable plan
That everything is oneness with the land
When you are valley and I am the land."

"Hold April"
Jesse Stuart

Program Description

Vignette:

"What makes a forest?" is answered by childrens' voices and drawings. When repeated, the question is then answered by the forest. The forest's answer cascades over the childrens', showing the vast numbers of interconnected elements that make up the forest ecosystem.

Storyline:

The woman of the woods leads Heather and her friends to a log cabin in a clearing of the forest. When she introduces them to Roger, a famous Kentucky naturalist, they realize her voice is the mysterious voice they have been hearing all along. Roger and the woman then help the children understand some of the ways of nature. Six of the children are turned into an insect, a fish, a fawn, a hawk, a turtle, and a skunk, to see what the forest looks like through the eyes of animals. Excited by new awarenesses, the children ask, on their return, how they can learn more about preserving our precious natural resources.

Student Objectives

Present a story which describes the world as seen through the eyes of another animal
Collect various natural objects and classify them in appropriate categories. (Scavenger Hunt) 100" Hike
Collect poems, stories, pictures about nature and organize the collection into a notebook
Define "Habitat"
Design a habitat for an imaginary animal
Discuss the effects of human impact on the natural resources

Program III

"Break in the Storm"

ACTIVITY 1: Let's Talk About It

OBJECTIVE: Discuss the effects of human impact on natural resources.

After viewing the third program, discuss the following questions with your students:

1. How did you feel when you viewed the land from the Hawk's eyes? What did the hawk see?

2. What almost happened to the turtle?

3. What are some things that Patti was trying to teach Heather and her friends about learning from the forest?

4. Why did Roger say "kids today don't care"? What was he talking about?

5. What do you think the Thunder at Middle Ground means for the wild animals? (Refer back to the discussion from Program I, Activity 1.)

   Answer: Their conflict is losing their home or habitat to human expansion.

Program III

"Break in the Storm"

ACTIVITY 2: Merlyn, the Magician

OBJECTIVE: Present a story which describes the world as seen through the eyes of a wild animal.

MATERIALS: Worksheet I

Distribute Worksheet I and/or read the passage to your students. Explain that this passage is taken from a book entitled The Once and Future King by T. H. White. The book is about the life of a young boy named Wart who grew up to be the legendary King Arthur, King of England, and of a place called Camelot. King Arthur was known for his fairness and just rule to all people. His teacher was named Merlyn, the Magician. Merlyn turned Wart (Arthur) into various animals so Wart would better understand the order of nature and role of humanity. In this passage Merlyn turns Wart into a fish.

After you have finished reading the passage, have each student pick a wild animal and imagine that Merlyn has turned them into this animal for one day. Have them write a story which describes what their life was like for one day as this animal.

PAGES 30-41 "THE ONCE AND FUTURE KING" DELETED
DUE TO COPYRIGHT RESTRICTIONS.

Cardinal
Bond

Program III

"Break in the Storm"

ACTIVITY 3: Scavenger Hunt

OBJECTIVE: Collect various natural objects and classify them into appropriate categories

MATERIALS: Worksheet J, paper bags

Have your students do the scavenger hunt on Worksheet J. When they have finished, set up a corner in your classroom to display the items they have collected. Group items according to their relationships, colors, number, size, similarities, etc., depending upon the current subject area and needs of your class. You now have the makings of an environmental learning center! See Appendix E for more details.

WORKSHEET J (Program III, Activity 3)

Nature Scavenger Hunt

Using a paper bag, go outside and try to find the following items!

Something blue

Something cool

Bird food

Something that makes soil

Something younger than you

Something dead

Something that tickles

A plant that hitches a ride (plant part)

The smallest bit of life that makes food from sunlight

A hiding place for a small animal

A color that captures the sun's energy

A nut

Pine needles

A small plant that floats on the water in a puddle or small pond

A decomposer

Something that shows a "glut" has been around

A fossil

Two different types of leaves

An insect

Something that smells good

Some of these suggestions are taken from Language Arts with an Environmental Twang, Miriam Litchfield.

Program III

"Break in the Storm"

ACTIVITY 4: Making a habitat

OBJECTIVE: Define "Habitat". Design a habitat for an imaginary animal.

MATERIALS: "Our Precious Natural Heritage" poster, glue, construction paper (different colors), markers, clay, cardboard, scissors, scrap material, leaves, rocks, twigs, (nature litter), toothpicks, some books by Dr. Suess such as The Lorax.

Write the word "habitat" on the board. Beside it write the following definition. Habitat - The area or type of environment in which an organism (plant or animal) normally lives or occurs.

Looking at the poster on endangered plants and animals of Kentucky, ask students where they think these organisms might be found -in what kind of "habitat" would they occur.

After the concept of habitat is fully understood, challenge the students to design a habitat using the materials provided for a make believe animal. You might stimulate their thinking by referring to some of the imaginary characters created by Dr. Suess; The Lorax is particularly good for emphasizing environmental problems.

For Further Activity:

Animal Charades

Have students choose a wild animal they think is interesting. The rest of the class must figure out what animal the student is by asking questions that can be answered yes or no. The one who guesses the animal correctly is next to choose.

Thunder at Middle Ground

Program IV

"Light on the Middle Ground"

Americans have lost their love for land.
Men have grown far away from land and plows,
The greenback dollars hold them in command.

"Songs of a Plowman"
Jesse Stuart

Program Description:

Vignette:

Sarah Cynthia Sylvia Stout would not take the garbage out and becomes engulfed in trash and litter because of her own irresponsible attitude.

Storyline:

Heather and her friends are challenged to find ways in which they can overcome the environmental destruction of Kentucky's natural areas and quiet the Thunder at Middle Ground. They interview people from the past and present who give them insights into ways to both use and preserve the Middle Ground. The children decide to make individual commitments to help change the present course and give renewed respect to the Middle Ground.

Student Objectives:

Combine and organize a natural heritage notebook of Kentucky.

Identify various careers and hobbies which promote good stewardship of Kentucky.

Discuss ways individual change can improve environmental deterioration.

Choose a personal action that will directly benefit environmental conditions.

Program IV

"Light on the Middle Ground"

ACTIVITY 1: What is Thunder

OBJECTIVE: Discuss way individual action can improve environmental conditions

MATERIALS: Worksheet K, pencils

Pass out and discuss with your students the questions on Worksheet K. Refer back to earlier discussions about the meaning of "thunder" at Middle Ground. Remind students of the Indian name given for Kentucky as the Middle Ground because no one owned the land; they kept fighting for control of the natural resources. You may need to emphasize that the thunder today is the conflict over land use, much the same as it was historically. Today however the damage is much more long term. Discuss with your students current conflicts such as strip mining, acid rain, hazard waste disposal and loss of prime farm-land to encroaching suburbia. Although these topics are somewhat complex for 4-6 grade concepts, you can briefly explain the struggle. Another dimension of the "Thunder at Middle Ground" is the personal conflicts we all encounter in daily living with our environment. How do we feel personally when the air is stagnant from pollution, when an area where we play is full of trash and broken bottles? What is the Thunder for each of the characters interviewed by the children? Roger, the biologist, doesn't want to see the wild animals lose their homes; Bud, the plants expert, doesn't want to see the wild plants disappear, many of which we use for medicine. Be sure to conclude the discussion with your students' perceptions about the future "Thunder at Middle Ground". What does Kentucky's future hold for each one of us. Will we be able to resolve the conflicts and create a healthy state which benefits each one of us?

WORKSHEET K (Program IV, Activity 1)

1) Who was your favorite character interviewed by the children in Thunder at Middle Ground?

Why did you like that character?

2) What is an environmental education center?

3) What is a fossil? How can a fossil help you learn about the past?

4) What is a solar home?

5) What is the"thunder at middle ground"?

6) What are some things you can do to help quiet the thunder?

7) What are some things your class can do to help quiet the thunder?

Kentucky's past conflicts often arose among Indian tribes over hunting rights. Land in the Bluegrass Region was so plentiful with wild animals that tribes fought each other for use of the land. What are some present day problems in Kentucky which deal with use of the land?

Program IV

"Light on the Middle Ground"

ACTIVITY 2: Exploring a New Frontier

OBJECTIVE: Identify various careers and hobbies which promote good stewardship of Kentucky

MATERIALS: Worksheet L, pencils

Worksheet L is a simulation game for you and your students to play. It contains a list of characters who appeared in the program and gives you a biographical sketch of each. Each person actually played themselves, so these biographics are real! After your class has finished playing the game, then discuss the various backgrounds of these people -point out the opportunities available for each of us to become a "Kentucky naturalist". Discuss with your class the following quote by Ian McHarg taken from his book Design with Nature on defining a "naturalist".

> "Now, the Naturalists believe less than we do in the divisibility of man from the rest of the biosphere; they think of man in nature rather than against nature. They have a vivid sense of the other creatures in the earth as being of themselves." p. 122

Instructions for the Simulation Game:

Duplicate and pass-out Worksheet L. Read this Worksheet with your students. The Worksheet explains the background of each character interviewed by the children in "Thunder at Middle Ground". Put the names of each character on the chalkboard. Now have the children vote on the five people they must choose to live on the planet. Put tally marks beside each name. After students defend why they think their choice is best, tally the marks to see which 5 will go on the trip.

WORKSHEET L (Program IV, Activity 2)

It is the year 2081. You are director of a spacecraft from Earth and are planning a trip to the planet Eco in the Solar system of the second sun. Earth's resources are limited and abused and the purpose of your mission is to seek out new worlds for human colonization. Planet Eco was recently discovered by satellite probe. It has been identified as having conditions like those on Earth (oxygen, water, plants, animals, etc.).

As director of this important space flight, you are to choose five people to take with you to explore and colonize planet Eco. Thousands of people have applied to go on this trip and the computer has narrowed down this list to 9 people. It is up to you, the flight director, to choose the best five from that list. Because of the human abuse of the natural resources on Earth, you want to be sure to select the five people who would have the best survival skills to live on planet Eco, in addition to understanding the importance of using the resources in a re-usable and thoughtful way, a way which would not abuse planet Eco but would support the lives of the new human occupants.

Your difficult decision will be based on the limited knowledge you have of each person in the following descriptions. If you and the five people you choose live successfully on Planet Eco for ten years, more humans will be sent to establish a new civilization there. You and those you select will be establishing the "Law of the Land" for a new civilization.

1. Patti is the caretaker of animals and plants at a nature center. She has many years of experience in working with various people who come to visit the center. She develops and teaches programs to schools and other folks who want to come to the nature center to learn more about the cycles of nature. She has some knowledge about wild foods and plant identification and is well versed in first aid safety and survival skills in the out-of-doors.

2. Roger is a biologist. He has spent most of his life studying wild animals. This study has taken him into wild areas where he spends weeks in the out-of-doors living in a tent observing animals in their own habitat. He has special knowledge of animal behavior. He has written many books on animal and plant identification. Roger has traveled in various parts of the world to study different animals.

3. Mary is director of an Environmental Education Center. She spent part of her life living with various people studying their cultures. This included living with an Aboriginal tribe in the jungle. She has always enjoyed exploring new and different environments. She has a special interest in the study of rocks and fossils, which gives her clues and insight into the cycles of nature. She enjoys teaching children about the wonders of the land.

(More)

WORKSHEET L (continued)

4. Harry is an architect. He enjoys designing buildings and homes, especially ones which use solar energy principles. He has special knowledge on ways to build a house using natural materials and heating which use very little energy. One of his outside activities is membership in the Kentucky Corps of Longriflemen. This group uses primitive weapons, such as those used by frontiersmen, to hunt game and fish.

5. Maggie is an outdoor education teacher at an environmental education center. She is an avid hiker and canoe enthusiast. Maggie has special knowledge on ways to recycle various items. She can take almost any object, (man made or natural), and turn it into a useful tool.

6. Dee has special interest in law and decision making. On earth she works for the government and researches and writes laws for the legislature. Laws concerning energy conservation and solar use particularly concern her. Dee and her husband, Sam, also have built and live in an underground solar home.

7. Bud has spent his life studying edible wild plants. He has a vast knowledge of their usefulness as a food source, and has also studied their medicinal uses. He enjoys cooking and can make a feast from wild plants found in his own backyard.

8. Hal is an organic farmer. He has learned how to grow foods in great quanitity without having to use harmful chemicals to control the insects. As an organic farmer, he recognizes the importance of utilizing waste material such as manure to make good soil.

9. Jim is an anthropologist. He studies the past histories of various cultures and how those cultures learned to live with the land. In addition, he runs an historical 1840's farm which demonstrates ways in which pioneers used to farm the land. By operating this farm, he has learned how to raise crops using primitive tools.

10. Cynthia is very knowledgeable about the medicinal uses of wild plants for curing simple ailments and relieving pain. Her studies have lead to her belief that we must protect plant habitats so we can learn more about their possible medicinal uses.

Program IV

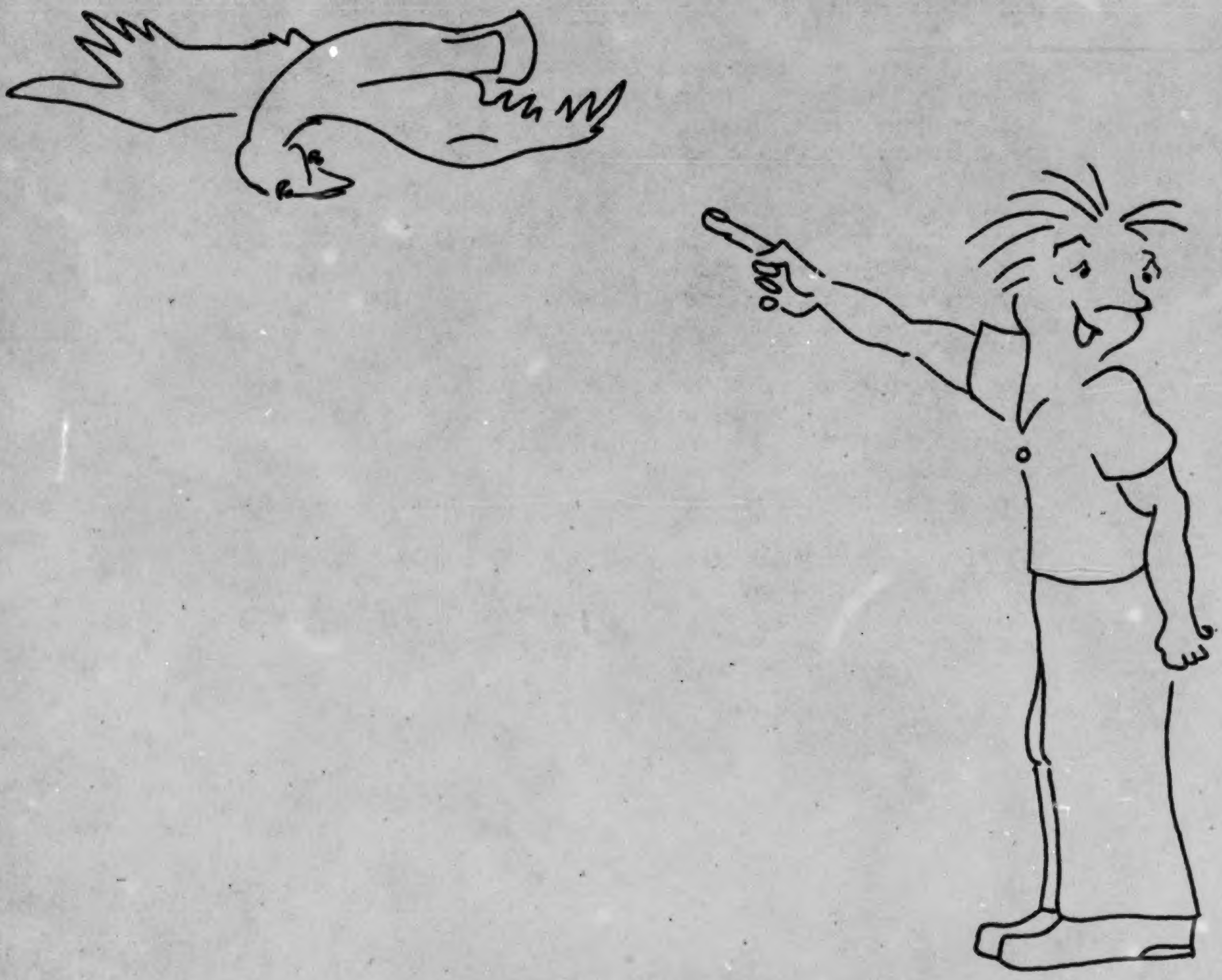
"Light on the Middle Ground"

ACTIVITY 3: Protecting our Natural Heritage

OBJECTIVE: Combine and organize a natural heritage notebook of Kentucky

MATERIALS: Large notebook, magic markers, colorful notebook paper, Worksheet M

Duplicate and distribute Worksheet M. After your class has read Worksheet M, have each student list 5 ways that he or she can help protect our natural heritage in Kentucky. Combine the class lists and have students write each suggestion on notebook paper, illustrate it and put it in the notebook. Refer to the book throughout the year and use it as a checklist for what we all can do to protect Kentucky's natural heritage. Showing a friend something interesting about nature is one way you can help!



WORKSHEET M (Program IV, Activity 3)

OUTDOOR MANNERS

I AM AN OLD TIME COUNTRY LANE - just a plain dirt road with a lot of ups and downs, built by the pioneers who settled this region. I was abandoned, thank goodness, after those tin Lizzies began to honk and rattle thru the country. They didn't like me and I didn't like them.

For more than a century, people went this way on foot, on horseback, and in vehicles drawn by horses or mules. I became well acquainted with many of them and some of their great-grandchildren. They became acquainted with my trees, my wildflowers, my birds and all my wild creatures. In those days most folks were friendly, neighborly people. They had time to stop, visit, look and listen.

Now I'm used only by walkers. Scads of them come in May when the roadside thicket of hawthorns and crabapples are in bloom. Some are mainly interested in wildflowers or in watching birds. Mostly, though, they are hikers, groups of youngsters from camps, or families and picnicers out for a stroll.

Unfortunately, a lot of them do not have what I call good outdoor manners. Some are apparently strangers in the out-of-doors and don't know any better. Others must have had poor upbringing. Many are merely boisterous, careless, and remind me of a sign in a nearby picnic grove which expresses my feelings exactly:

Paper, garbage, broken glass,
Scattered here upon the grass,
Make a fellow scratch his dome
And wonder what you do at home.

I get mighty provoked sometimes, especially at the vandals who lop off branches laden with blossoms or, in autumn, with gaily colored leaves. I wish I could talk. I'd tell 'em what I heard a teacher tell her class on a field trip: "These forests are yours and mine too. They belong to all of us. If I damage or litter them, I am hurting your property. If you do that, you are hurting mine. Here we have a place in the country that the richest man does not have and could not buy. You should be proud of them, protect them, and use them wisely."

Too many people are what I call "scatterwalkers", They leave a trail of litter wherever they go. Nowadays almost everything comes wrapped in paper, cellophane or tinfoil, in handy little cans, or in bottles that never decay. Those, as well as Kleenex, are carelessly tossed aside.

I wish everybody had outdoor manners like a family that came sauntering along here last week and stopped for lunch beneath a big white oak. After the children gathered a lot of dead twigs, the man showed them how to build a small fire on a bare place in the road where they toasted wieners, buns and marshmallows. Using paper cups, they drank milk from two cartons carried in his knapsack. After burning the paper bags, cups and cartons, they carefully put the fire out and then, using a dead branch, swept the place where the fire was and even the grass where they sat, so that when they left, there was no trace of anyone being there. If you are that kind of people, come and see me sometime.

Program IV

"Light on the Middle Ground"

ACTIVITY 4: Making a Pledge for Wildlife

OBJECTIVE: Choose a personal action that will directly benefit the environment

MATERIALS: Worksheet N, pencils

Referring to the Heritage Notebook in Activity 3, have students list as a group as many ways as possible each person can help protect and conserve our natural resources. After this list has been compiled on the board, have the students fill out the pledge card on Worksheet N. You may want to extend this activity outside the classroom and use it as a fund raiser for your environmental club, scout group, etc. There are many conservation programs who could use support.

Appendix C contains information on the "Be Wildlife Wise" campaign underway in Kentucky. This is a voluntary opportunity for Kentucky taxpayers to give any or all of their tax refund to help wildlife. Half the money goes to purchase and maintain nature preserves and half to a non-game species program. Students can insure that their parents are aware of this opportunity.

There are so many things an individual can do, such as:

--recycle paper, aluminum, glass
--be conservation minded about the use of water and electricity
--plant a garden, no matter how small
--educate oneself or a friend about endangered species or solar power

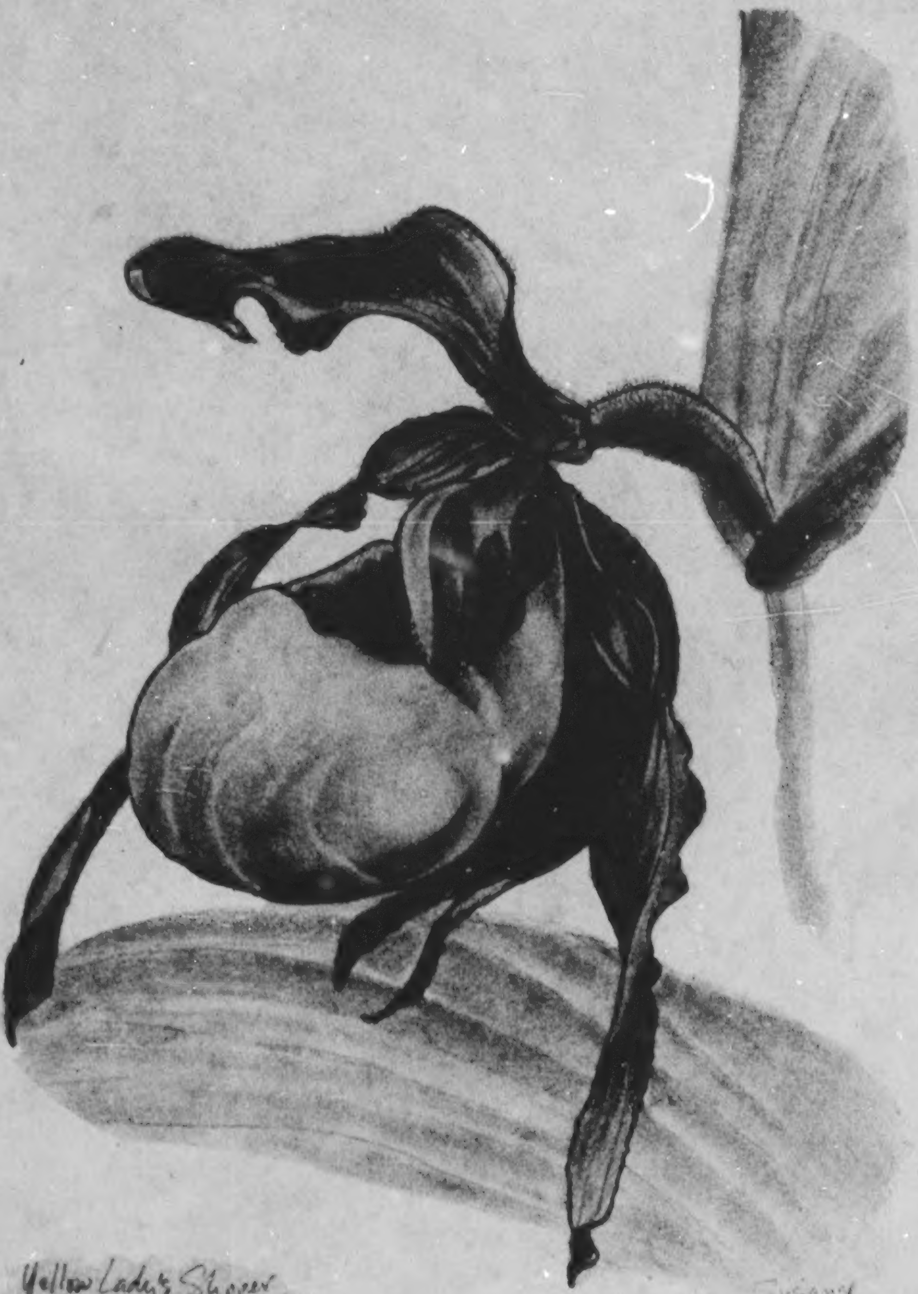
WORKSHEET N (Program IV, Activity 4)

Note to teacher: this pledge card can be cut out and pasted on a 3 x 5 card

PLEDGE CARD

I, ________________________________, a student at
________________________________ School
will pledge to do the following to help protect wildlife and Kentucky's natural resources:________________________
____
____
for one month beginning:___________________________

I, (teacher or parent)______________________________
certify that ______________________________________
completed the above pledge.



Yellow Lady's Slipper

OUR PRECIOUS NATURAL HERITAGE - A POSTER

INTRODUCTION

The poster, "Our Precious Natural Heritage", was developed to aid in creating an awareness about Kentucky's rich natural heritage. The poster may be used by many simply as decoration; however, it can also serve as a dynamic teaching tool. We have provided several activities to accompany the poster. The names of the plants and animals have been omited from the face of the poster to facilitate its use in sight recognition of the species. Many of the species of plants and animals will be unfamiliar, a fact we hope will prompt the question, "What is that plant or animal"? Perhaps these questions will lead to many more. A description is provided for every species on the poster at the end of this section. These descriptions include life history information and details sufficient to make teachers familiar and comfortable with discussing each species.

Please do not hesitate to research these species further at the library or have students do special projects on them. Many libraries across the state have purchased the Natural Areas Plan to use in research projects. This three volume publication is available at cost ($45.00) from the Kentucky Nature Preserves Commission, 407 Broadway, Frankfort, Kentucky. It is periodically updated to provide the most current information on Kentucky's natural heritage. Please check your library. An order form is included in the attachments to this Handbook.

It should be noted that the species on the poster are found in small numbers in Kentucky, and only represent a few of the species in Kentucky that need special consideration if they are to remain as part of our natural heritage.

The activities and their objectives outlined below are designed to stimulate the student's imagination and thought processes, and to create awareness through knowledge of the plants and animals on the poster.

Don't Peek!

Objective: Draw and discuss the habitats of the animals and plants on the Kentucky's Rare and Endangered Poster.

Believe it or Not!

Objective: Collect and record interesting facts about plants and animals.

Kentucky's Lucky!

Objective: Identify natural areas in Kentucky on a map.

There's No Place Like Home!

Objective:	Match pictures of plants and animals to pictures which best represent their habitats.

Burrr!!!

Objective:	Illustrate and discuss winter habits of animals and plants.

Which Part Belongs To What?

Objective:	Identify various parts of plants and animals.

Seek and Find

Objective:	Find the common names of species on the "Our Precious Natural Heritage" Poster on the word-search puzzle.

OUR PRECIOUS NATURAL HERITAGE

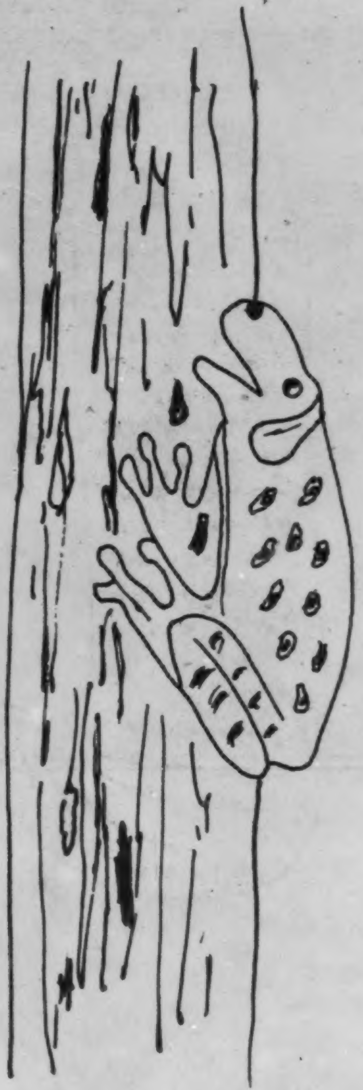
ACTIVITY 1: Don't Peek!

OBJECTIVE: To draw and discuss the habitats of the animals and plants on the Kentucky's Rare and Endangered Poster

MATERIALS: Crayons, markers, paper

Before showing your students the poster provided, give each student one of the names of the plants or animals that appear on the poster. Have them draw a cartoon caricature of the plant or animal just by looking at its name. Example: What would you think a barking tree frog looks like? How about a woodland jumping mouse or a Townsend's big-eared bat? What is a pink turtlehead? Is it a plant or animal?

Don't peek yet! After the students have drawn cartoons of their plants or animals have them draw a picture of the place they think it might live. When finished have the students show their pictures to the class. Discuss why they think their plant or animal would live in an area like the one they drew. After all the drawings have been discussed and displayed, show the real pictures of the plants and animals they had.



OUR PRECIOUS NATURAL HERITAGE

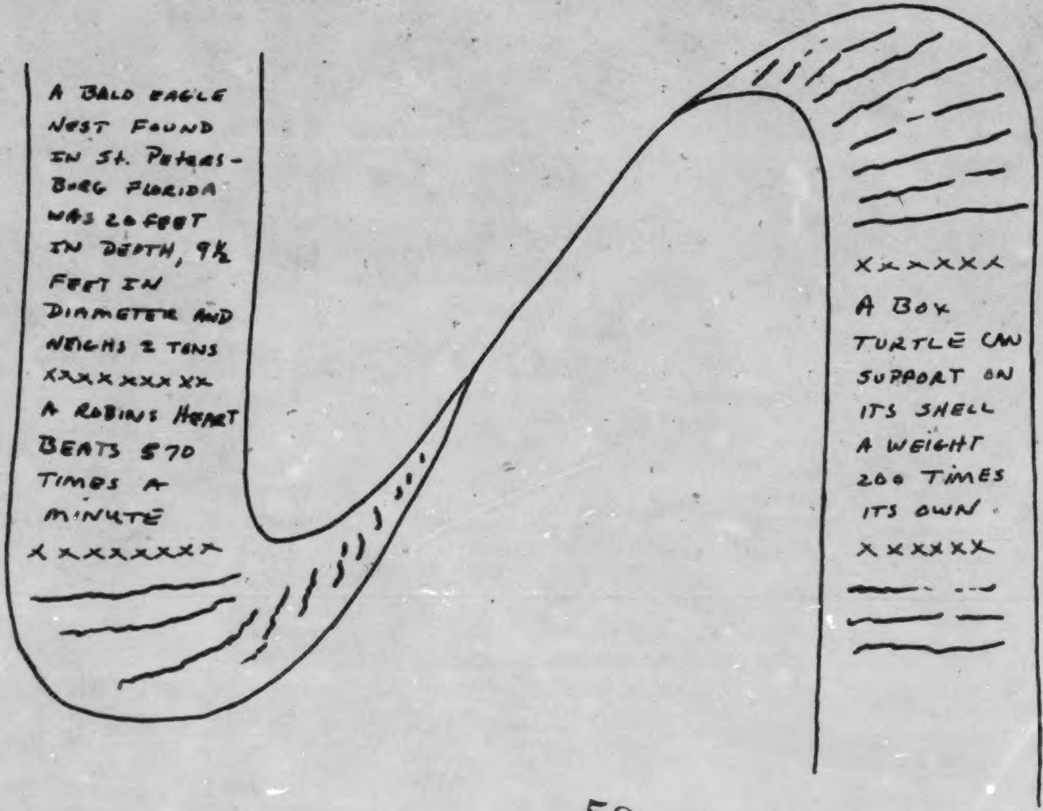
ACTIVITY 1: Believe it or Not!

OBJECTIVE: To collect and record interesting facts about plants and animals. To identify various parts of plants and animals.

MATERIALS: Long strips of shelf paper or used computer printouts, reference books, markers, pencils, paper

Using reference books, magazines and nature books, have students find interesting facts and information on animals and plants found in our state (be sure to include some of the ones from the poster). Have students transfer these amazing facts to strips of shelf paper and hang them around the room or use one long strip and hang it all over the room. Keep adding to it as the school year progresses.

Create a world's record long fact sheet of unusual and interesting record facts about Kentucky plants and animals.



A BALD EAGLE NEST FOUND IN St. PETERS-BURG FLORIDA WAS 20 FEET IN DEPTH, 9½ FEET IN DIAMETER AND WEIGHS 2 TONS XXXXXXXXX

A ROBINS HEART BEATS 570 TIMES A MINUTE XXXXXXXX

XXXXXX

A BOX TURTLE CAN SUPPORT ON ITS SHELL A WEIGHT 200 TIMES ITS OWN. XXXXXX

OUR PRECIOUS NATURAL HERITAGE

ACTIVITY 1: Kentucky's Lucky!

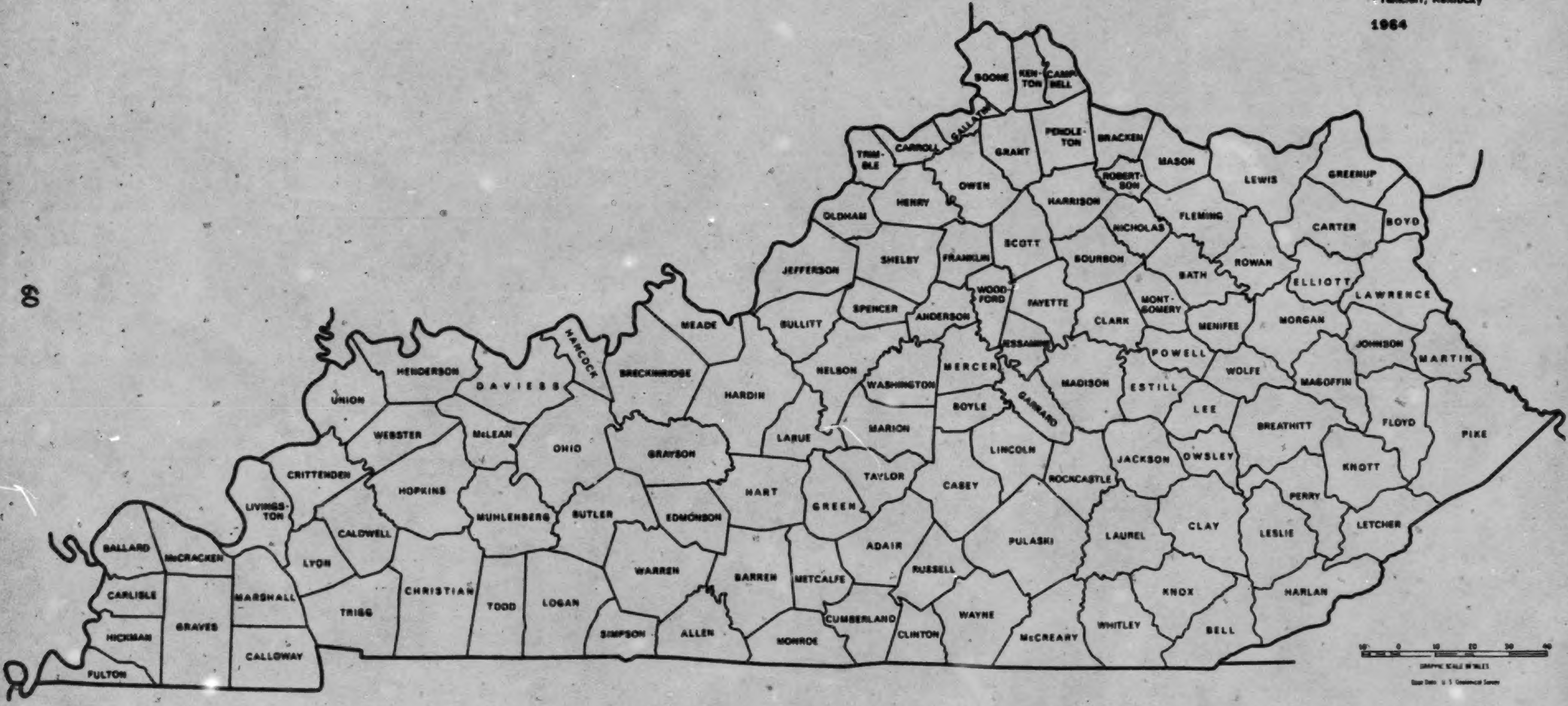
OBJECTIVE: To identify wild areas in Kentucky on a map

MATERIALS: Map pins, map of Kentucky with counties, (see next page) name tags

Make a large map of Kentucky on your bulletin board. Using map pins and tags with various endangered/rare animal and plant names which are located in Kentucky, have students put the names on the map where these animals and plants are most likely to be found in our state. Stress to students how lucky we are to have this variety of natural heritage in our state and how we all must take action to protect it. Refer to the Kentucky Natural Areas Plan for all rare species occurring in any one county.

KENTUCKY Base Map Series B-5
Compiled and distributed by
Kentucky Department of Commerce
Frankfort, Kentucky

1964


BOONE
KEN-TON
CAMP-BELL
GALLATIN
TRIM-BLE
CARROLL
GRANT
PENDLE-TON
BRACKEN
MASON
LEWIS
GREENUP
OWEN
ROBERT-SON
HARRISON
HENRY
OLDHAM
FLEMING
CARTER
BOYD
NICHOLAS
SCOTT
SHELBY
FRANKLIN
BOURBON
ROWAN
JEFFERSON
BATH
ELLIOTT
LAWRENCE
WOOD-FORD
FAYETTE
MONT-GOMERY
SPENCER
ANDERSON
MEADE
CLARK
MENIFEE
MORGAN
BULLITT
JESSAMINE
POWELL
JOHNSON
HANCOCK
NELSON
MERCER
WOLFE
MARTIN
HENDERSON
DAVIESS
BRECKINRIDGE
WASHINGTON
MADISON
ESTILL
MAGOFFIN
UNION
HARDIN
GARRARD
BOYLE
LEE
FLOYD
WEBSTER
McLEAN
LARUE
MARION
BREATHITT
PIKE
OHIO
GRAYSON
LINCOLN
JACKSON
OWSLEY
KNOTT
CRITTENDEN
TAYLOR
ROCKCASTLE
HOPKINS
HART
CASEY
PERRY
LIVINGS-TON
GREEN
LETCHER
MUHLENBERG
BUTLER
EDMONSON
BALLARD
CALDWELL
CLAY
LESLIE
McCRACKEN
LYON
ADAIR
PULASKI
LAUREL
WARREN
CARLISLE
MARSHALL
CHRISTIAN
BARREN
METCALFE
RUSSELL
HARLAN
TRIGG
TODD
LOGAN
KNOX
HICKMAN
GRAVES
WAYNE
CUMBERLAND
SIMPSON
ALLEN
MONROE
CLINTON
McCREARY
WHITLEY
BELL
CALLOWAY
FULTON
10 0 10 20 30 40
GRAPHIC SCALE IN MILES
Base Data: U.S. Geological Survey

OUR PRECIOUS NATURAL HERITAGE

ACTIVITY 1: There's No Place Like Home!

OBJECTIVE: To match pictures of plants and animals to pictures which best represent their habitats

MATERIALS: Pictures of various habitats in Kentucky. Individual pictures of plants and animals in Kentucky (include ones on poster)

Find some pictures or draw illustrations of the different habitats found in Kentucky. Include: open fields, forests, creeks, lakes, swamps, cliffs, rivers, mountains, farmlands, caves, suburbs, and city. Have students place pictures of plants and animals under the habitats they think these plants and animals would live. Be sure to include the endangered plants and animals on the poster!

If you cannot find pictures of the plants and animals on the poster then have students draw individual pictures from the poster. Include other plants and animals in Kentucky (examples: opossum, raccoon, catfish, red maple tree, western cedar tree, bluegrass, bobcat, cardinal, blue jay, meadowlark, garter snake, eastern box turtle, black-eyed susan, largemouth bass.

Be sure to discuss with students why they think some plants and animals become endangered while others do not. Compare the lifestyle of an opossum and a bald eagle. Why is the opossum surviving in our environment better than the eagle?

Discuss the fact that there are many smaller habitats within each of the above areas. For instance, some fish only live in the fast flowing area of a stream while others live only in the slow moving pools.

OUR PRECIOUS NATURAL HERITAGE

ACTIVITY 1: Burrr!!!

OBJECTIVE: To discuss winter habits of animals and plants

MATERIALS: Poster, Plant and Animal Descriptions

Have students each take a species and describe how they think it will spend the winter. Class discussion of each species should take place. Comparison of cold-blooded and warm-blooded animals would be imporant. There are many good books on hibernation and migration available at the library. Refer to species write-ups for information on winter habits of poster species.

OUR PRECIOUS NATURAL HERITAGE

ACTIVITY 1: Which Part Belongs to What?

OBJECTIVE: To identify various parts of plants and animals

MATERIALS: Worksheet O

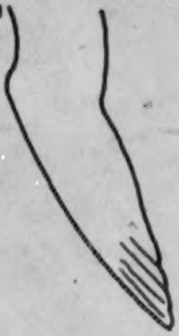
Have students try to match the correct plant or animal on Worksheet O with the endangered plant or animal on the poster (either mimeograph or trace the parts or enlarge them and cut each out and place on a piece of cardboard).

LEGEND

a Wing of Least Tern
b Wing of Townsend's Big-eared Bat
c Fin of Blackside Dace
d Tail of Woodland Jumping Mouse
e Flower of Painted Trillium
f Flower of Pink Turtlehead
g Wing of Diana butterfly
h Ear of Townsend's Big-eared Bat
i Beak of Bald Eagle

WORKSHEET O (For Which Parts Belongs to What)

a



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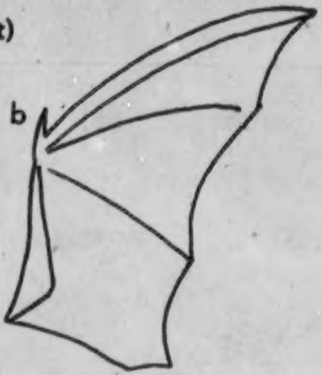

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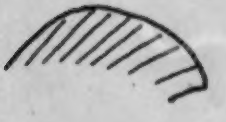

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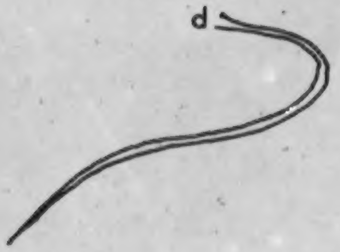

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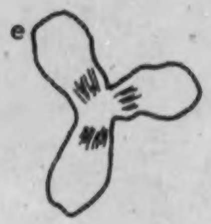

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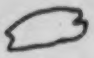

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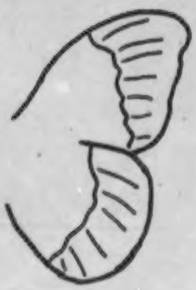

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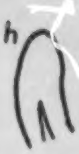

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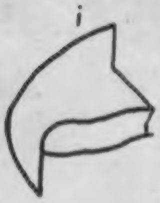

OUR PRECIOUS NATURAL HERITAGE

ACTIVITY 1:	Seek and Find
OBJECTIVE:	To find the common names of species on the "Our Precious Natural Heritage" poster on the word-search puzzle (next page)
MATERIALS:	Worksheet P (word search puzzle), Worksheet Q (names of species) and pencil

All of the plants and animals on the poster are hidden in the letters on the puzzle. They may be found horizontally, vertically, or diagonally and read left to right, right to left, upside down, or right side up. The full names found on the Legend to the poster are used in this exercise, so Townsend's Big-eared Bat would be found without spaces between the letters, and would not just appear as "bat". No answer sheet is provided. Have fun.

WORKSHEET P (for Seek and Find) **WORD SEARCH PUZZLE**

X	F	O	N	E	S	C	A	R	L	E	T	S	N	A	K	E	M	H	U	S	U	E	T	S	A	R	H	F	C
Q	O	S	O	D	H	G	B	A	L	D	E	A	G	L	E	I	S	U	H	N	J	R	A	H	M	K	N	I	U
H	U	M	R	A	P	I	N	K	T	U	R	T	L	E	H	E	A	D	S	Y	T	U	L	P	E	S	U	O	M
I	R	Q	T	L	E	S	J	C	N	O	I	S	U	T	S	M	U	T	Q	E	U	T	H	I	R	K	A	G	B
E	T	G	H	B	U	T	W	I	L	D	R	I	C	E	N	Q	N	S	T	L	I	A	P	R	I	S	D	U	E
B	O	J	E	Y	T	E	Y	W	C	U	Z	W	I	S	U	H	T	N	U	L	W	N	N	A	C	H	I	S	R
A	E	L	R	A	A	E	L	A	Z	A	D	E	R	I	O	P	R	A	F	O	E	M	O	V	A	T	H	U	L
H	D	O	N	W	R	E	P	P	I	L	S	Y	D	A	L	E	T	I	H	W	C	O	C	S	N	A	C	R	A
E	S	O	C	T	M	D	B	Q	E	R	E	C	R	O	F	P	W	H	N	I	A	P	L	I	B	O	R	E	N
L	A	N	A	N	S	C	L	A	N	L	O	S	S	E	I	L	G	R	O	S	D	R	A	M	R	E	O	M	D
P	L	Q	V	R	A	Z	E	B	L	E	Z	O	P	S	T	O	E	K	P	H	E	N	F	A	O	S	D	A	B
A	A	S	E	E	M	D	T	O	N	F	R	A	J	O	U	N	P	S	U	G	D	F	E	N	O	P	E	M	E
M	M	T	F	H	I	S	W	R	B	A	R	E	K	C	S	G	T	A	R	E	I	I	N	I	K	U	G	O	A
N	A	U	I	T	E	W	A	H	E	G	N	L	V	I	I	T	F	G	I	N	S	N	I	H	L	A	N	U	N
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N	R	A	D	O	X	L	E	T	A	E	O	N	B	O	U	E	S	H	E	N	L	A	R	I	R	O	E	S	R
U	I	H	O	M	Y	O	T	I	P	O	F	A	R	H	A	D	O	C	T	A	B	F	E	H	E	R	L	O	L
O	Q	D	A	S	L	E	V	P	B	N	I	V	A	K	A	S	N	N	E	P	R	A	P	N	Y	O	P	R	Y
W	S	I	I	F	R	A	O	V	A	X	O	B	F	A	Y	H	I	E	H	T	Z	O	O	M	I	B	R	I	M
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O	B	A	C	H	M	A	N	S	S	P	A	R	R	O	W	W	L	I	S	E	T	A	H	A	E	S	F	A	S
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D	H	R	O	U	S	T	R	O	H	A	T	F	O	B	P	R	E	S	L	T	O	D	E	B	E	L	A	N	G
J	I	P	X	O	E	Q	E	S	I	V	S	P	V	P	N	Y	A	R	U	B	I	N	T	E	S	T	E	Y	D
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P	E	P	E	T	O	V	F	X	E	U	J	G	T	Y	O	S	T	D	S	V	G	L	D	T	F	O	T	U	S
I	V	Q	H	O	Q	E	V	J	F	Y	M	O	X	T	Z	H	V	L	Q	N	T	O	Y	M	E	G	H	T	R
N	V	S	I	E	H	S	I	F	Y	A	R	C	E	L	L	I	V	S	I	U	O	L	H	I	Q	H	U	N	E
G	H	E	S	T	O	P	U	T	U	M	O	S	T	U	O	Y	X	K	T	O	M	I	S	F	L	I	E	E	S
M	O	T	P	S	S	D	W	A	R	F	S	U	N	D	E	W	R	L	T	P	L	U	A	X	Q	O	H	K	A
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U	G	O	R	F	E	E	R	T	G	N	I	K	R	A	B	I	O	M	G	J	L	U	I	U	L	P	O	M	F
S	P	A	I	N	T	E	D	T	R	I	L	L	I	U	M	V	J	O	O	S	Z	M	A	F	H	I	J	H	A
E	O	T	H	U	E	M	U	N	O	T	O	W	N	S	E	N	D	S	B	I	G	E	A	R	E	D	B	A	T

WORKSHEET Q (For Seek and Find)

COMMON NAMES OF POSTER SPECIES

Alligator Snapping Turtle
American Brook Lamprey
Ashy Darter
Bachman's Sparrow
Bald Eagle
Barking Treefrog
Blackside Dace
Copper Iris
Cumberland Bean Pearly Mussel
Daisy-leaf Grape Fern
Diana
Dwarf Sundew
Early Hairstreak
Four-toed Salamander
Fraser's Sedge
Grass-leaved Arrowhead
Least Tern
Long-tailed Shrew
Louisville Crayfish
Mountain Maple
Northern Cavefish
Northern White Cedar
Painted Trillium
Peregrine Falcon
Pink Turtlehead
Purple Fringed Orchid
Red Azalea
Red-cockaded Woodpecker
Scarlet Snake
Southern Twayblade
Townsend's Big-eared Bat
White Lady Slipper
Wild Rice
Woodland Jumping Mouse
Yellowish Gentian
Yellow-wood

ALLIGATOR SNAPPING TURTLE

Scientific Name: Macroclemys temmincki
Family: Chelydridae
Kentucky Status: Undetermined
Federal Designation: None

The alligator snapping turtle is the largest freshwater turtle in the world. Its normal maximum weight limit is slightly over 200 pounds, but one monster caught in Kansas in 1937 weighed 403 pounds. This species is seldom seen, for it dwells in the deep water of rivers, lakes, ponds, and swamps. The top portion of its shell (carapace) is extremely rugged and bears three rows of sharp keels. The rear margin of the carapace is strongly serrate. The bottom portion of the shell (plastron) is greatly reduced and much of the turtle's body is visible from beneath. Characteristically about as long as the carapace, the tail has three rows of low projections above and numerous small scales below. The massive head possesses powerful jaws; the upper jaw is strongly hooked. Teeth are absent (as in all turtles) but the sharp edges of the jaws could easily sever the fingers or toes of a careless person. The alligator snapper is quite an accomplished "fisherman". Its tongue possesses a worm-like double-ended movable process that when wiggled resembles a red worm. The turtle lies quietly with its jaws open and lures fish into its mouth. Mating usually occurs in spring and the female lays eggs, usually 15 to 50, in a nest cavity on land from which the young turtles hatch following an incubation period of 100 to 108 days. Alligator snapping turtles may live to be 60 years old.

(see map next page)

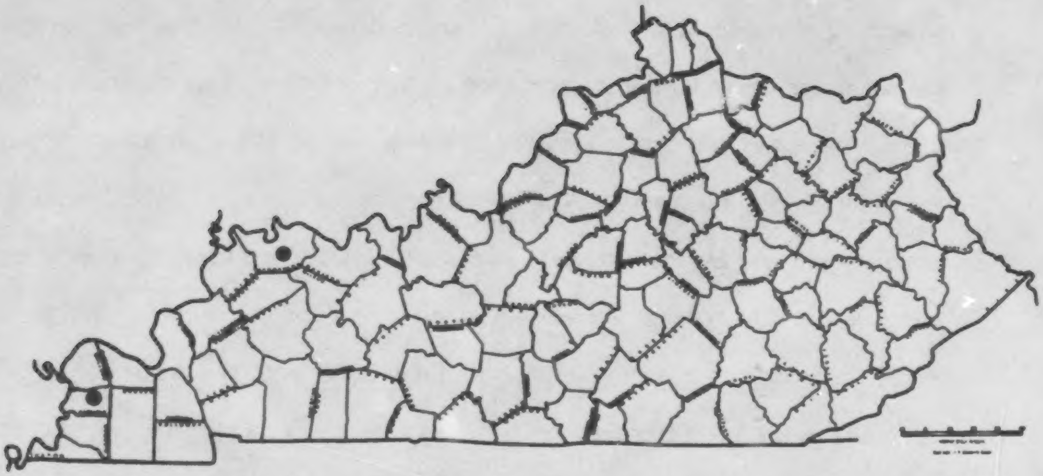
ALLIGATOR SNAPPING TURTLE

Scientific Name: Macroclemys temmincki

Family: Chelydridae

Kentucky Status: Undetermined

Federal Designation: None



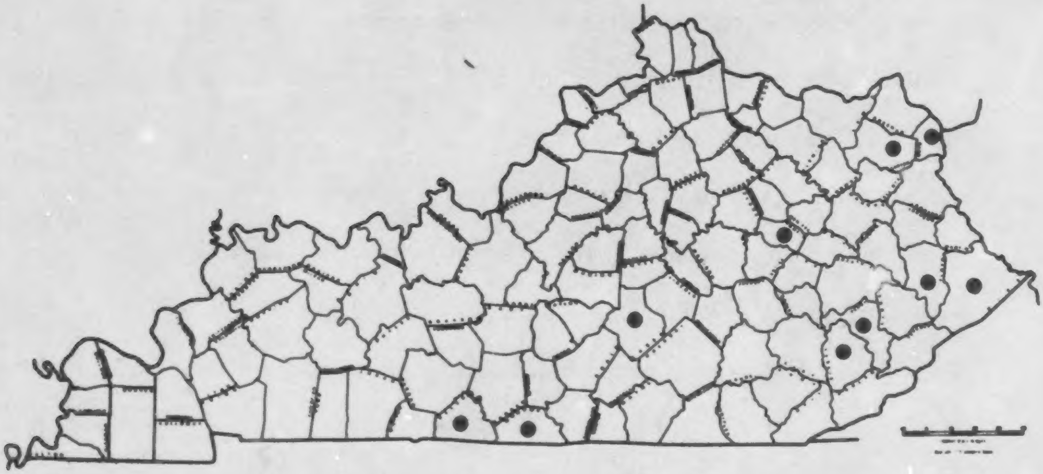
AMERICAN BROOK LAMPREY

Scientific Name: *Lampetra appendix*
Family: Petromyzontidae
Kentucky Status: Special Concern
Federal Designation: None

Lampreys are primitive survivors from very ancient times. They are the remnants of a group of jawless fishes that lived more than 350 million years ago. The lampreys are very distantly related to other present day fishes. Their snake-like bodies and smooth slippery skin reminds one of the eel; however, the resemblance is only superficial. Lampreys lack the paired fins (pectoral and pelvic) of eels. In addition, lampreys are jawless and have a sucking disc as a mouth. Instead of the familiar gill cover of most fishes, lampreys have seven pore-like openings along each side of the head with a single nostril opening in the middle of the head. Another distinguishing characteristic is the entirely cartilaginous skeleton, rather than the bony skeletons of most fishes. Many lampreys are parasitic (i.e. feed) on other fishes. The sucking mouth and specialized rasping teeth allow them to attach to the side of a fish, rasp a hole, and live off the blood of the fish. Unlike many other lampreys that feed on larger fishes by attaching to their sides, the American brook lamprey is non-parasitic (i.e. it does not depend on other fishes for food). The immature lamprey, upon hatching, drifts downstream and burrows tunnels into sand bars or fine clean gravel. From the burrows the young lampreys (ammocoetes) protrude their heads and strain microscopic plants and animals (plankton) from the water with their specially modified filtering mouth called a buccal funnel. The microscopic

(continued next page)

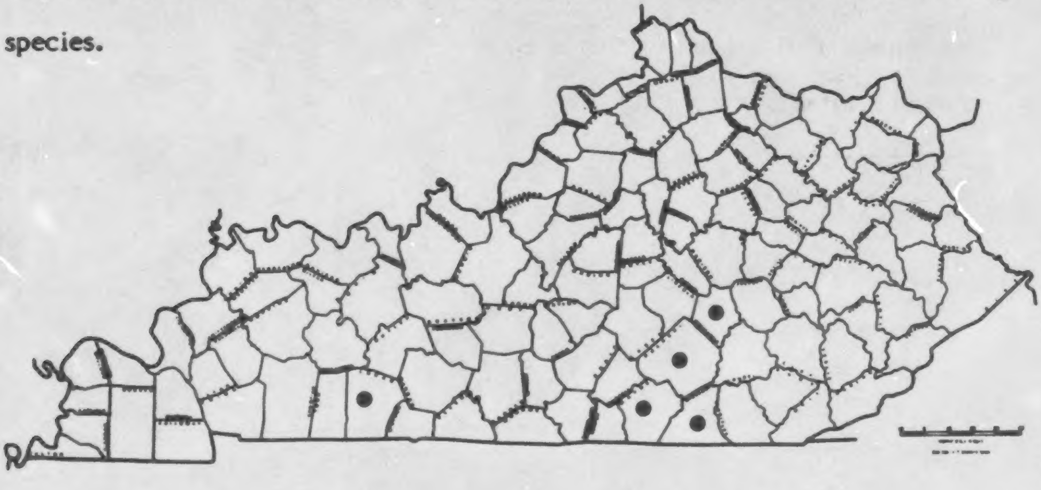
organisms help the ammocoetes to grow and after 3 to 5 years transform into adults. The adults (approximately 6 inches long) and ammocoetes serve as valuable food sources for other fishes such as trout and bass. Upon transformation into adults in winter, the digestive organs (i.e. intestine, stomach, etc.) atrophy and become non-functional. Transformation occurs over a period of several months and it is during this time that the adult characteristics such as development of ovaries and testes and full development of the sucking disc are acquired. The primary function of the adults is reproduction and, therefore, they do not feed. They swim upstream in late winter or early spring to small, clear creeks with riffle areas of sand and fine gravel. Both sexes participate in nest building. The nest is about 9 inches in diameter and is constructed by the lampreys moving stones with their mouths and by body undulations to clear away sand. From 2 to 15 lampreys may spawn over the same nest with females laying over 1000 eggs. The eggs hatch in 3-4 weeks and the young move downstream to begin the 3-5 year life cycle anew.



ASHY DARTER

Scientific Name: Etheostoma cinereum
Family: Percidae
Kentucky Status: Endangered
Federal Designation: None

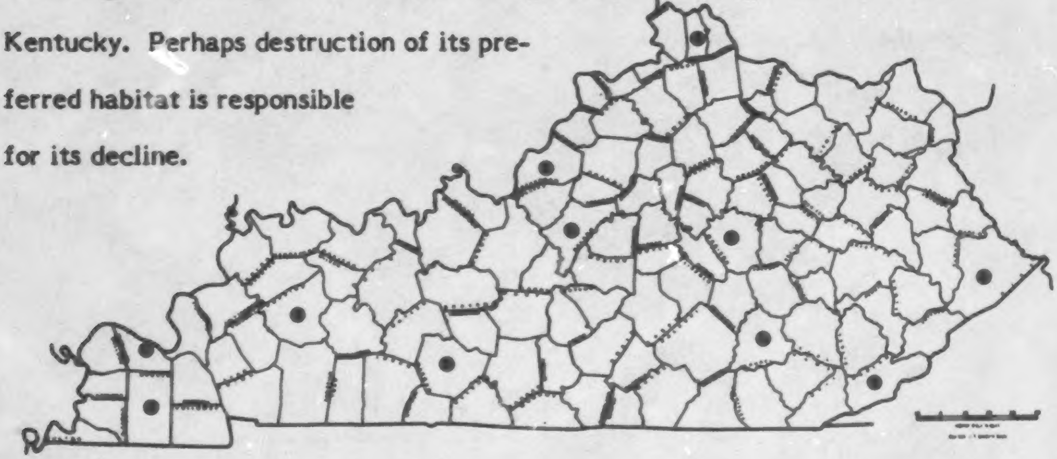
The ashy darter is a member of the perch family. This family contains the relatively small and little-known darters, and the larger and familiar game fishes such as the walleye, sauger, and yellow perch. Members of this family are distinguished from other fish families by the presence of two separate dorsal (i.e. back) fins. The front fin is spiny and the rear fin is composed of soft flexible elements called soft rays. The darters make up the largest group of the perch family with about 150 species known. Darters occur only in North America east of the Rocky Mountains and nowhere else in the world. Many species are known only from one or few rivers and streams. The ashy darter is known only from the Tennessee and Cumberland river systems of Tennessee and Kentucky, one of the rarest and least known darters in the entire Commonwealth. Like other darters the ashy darter spends much of its time on or very near the stream bottom. The pectoral and pelvic fins (paired fins) are modified and in positions which help the fish lie quietly in upright fashion on the bottom. They also function to hold the species in place in fast currents. When moving from place to place on the bottom, darters proceed in a series of short quick bursts of movement, thus earning them the name "darter". Darters, including the ashy darter, also lack or have poorly developed swim bladders. The lack of this organ, which helps other fishes maintain their position in the water column, is part of the darter's adaptation to life on the bottom of streams. They sink immediately to the bottom when they cease swimming and are thus not swept downstream by the current. The ashy darter feeds on small aquatic insects which live on and around the rocks and sticks in which it lives. Like most fishes, the ashy darter grows faster when the water warms in spring and summer; growth slows or may cease in the colder winter months as feeding and other activities also slow. In early spring the male ashy darter becomes very brightly colored, presumably in preparation for mating. Unfortunately, little else is known of the reproductive or general biology of the ashy darter. However, other darter species spawn with the female attaching the fertilized eggs to the underside of rocks or along the leaves and stems of aquatic plants. In many species the male remains with the egg mass to protect it from predators and to clear away any dirt or debris which might tend to cover the eggs. As noted before, the ashy darter is rare which makes detailed studies of the spawning act difficult if not impossible. Further complicating the matter, the species generally lives in large free flowing rivers near fast rocky shoals which makes study difficult. Perhaps in the future new techniques for study and observation will be developed so we can learn more about this interesting species.



BACHMAN'S SPARROW

Scientific Name:	Aimophila aestivalis
Family:	Fringillidae
Kentucky Status:	Threatened
Federal Designation:	None

Bachman's Sparrow resembles the better known field sparrow but is less rusty in color and has a dark bill. This shy bird is a very localized breeding species throughout the state. It favors old dry fields containing gullies that are well covered with weeds, grasses, blackberry brambles, and shrubs. It flushes reluctantly and drops back into the undergrowth, where its shy behavior makes it difficult to observe. Its song is variable but is usually a clear whistle followed by a loose trill or warble on a different pitch (Seeeeeee, slipslipslipslipslip). White, unmarked eggs, usually four or five in number, are laid in rather bulky ground nests made of coarse grasses. Nests are usually located in dense cover. This species is an uncommon and locally distributed summer resident in Kentucky. It arrives usually in early April and remains into October. Population levels of this bird appear to be declining, especially in the northern part of its range that includes Kentucky. Perhaps destruction of its preferred habitat is responsible for its decline.



BALD EAGLE

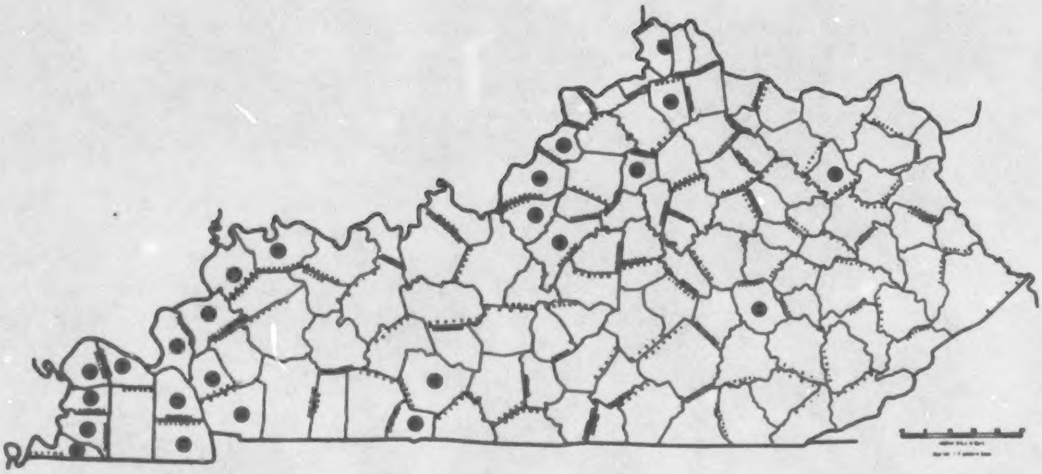
Scientific Name:	Haliaeetus leucocephalus
Family:	Accipitridae
Kentucky Status:	Endangered
Federal Designation:	Endangered

On June 20, 1782, our forefathers adopted the bald eagle as our national bird. In March, 1967, it was declared a federally endangered species. The adults are easy to identify with their white heads and tails. The immatures have a dusky-colored head and tail and usually have some white on the wing linings and breast. The bald eagle is a large bird that stands nearly 3 feet high and has a wing spread of 6 to 7½ feet. Its soaring ability is quite remarkable. The eagle's voice is a harsh, creaking crackle, "kweek-kik-ik-ik-ik-ik" or a lower "kak-kak-kak", and it feeds primarily upon fish, although ducks, geese, rabbits, squirrels, rats, and mice are also favorite foods. The bald eagle is a fairly common winter resident in western Kentucky and can be seen along the Mississippi River and at the Land Between the Lakes. Fewer numbers occur along the Ohio River and around the larger reservoirs elsewhere in the state. Bald eagles formerly nested in Kentucky but have not produced young in our state since the early 1950's. Efforts are currently being made by wildlife biologists to re-establish a breeding population in selected areas of western Kentucky. The wintering population of bald eagles is being monitored in the western Kentucky-Tennessee region in an attempt to protect these beautiful birds as an important part of our natural heritage.

(see map next page)

BALD EAGLE

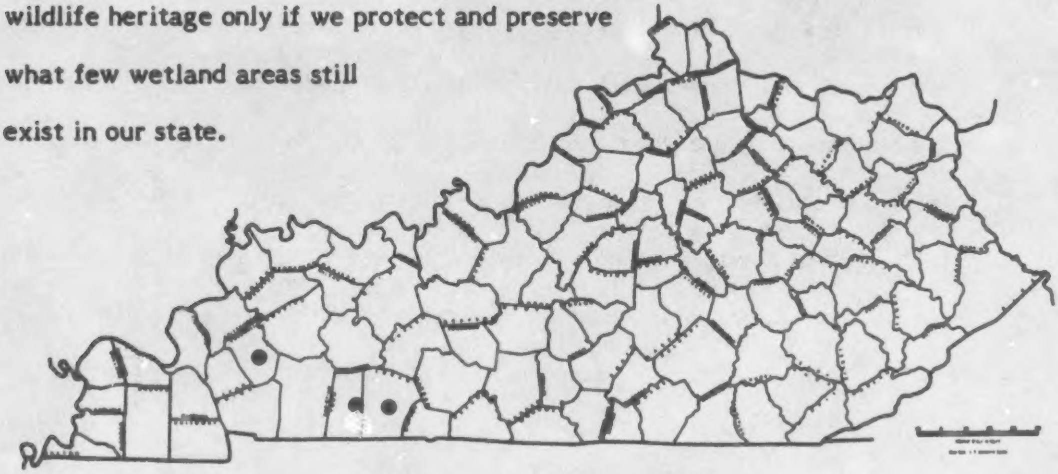
Scientific Name:	*Haliaeetus leucocephalus*
Family:	Accipitridae
Kentucky Status:	Endangered
Federal Designation:	Endangered



BARKING TREEFROG

Scientific Name:	Hyla gratiosa
Family:	Hylidae
Kentucky Status:	Endangered
Federal Designation:	None

Treefrogs are amphibians possessing large adhesive toe pads that enable them to climb trees and cling to branches. The barking treefrog is the largest native treefrog in North America and may be found in and around swamps, ponds, and wet woodlands. Its color varies from gray to green to brown. The back usually has distinct light spots and the belly is white or yellowish white. Its common name refers to its mating call, a deep "donk" or "tonk" which sounds like pounding on a hollow log. This species is active in the late spring and breeding occurs in shallow ponds after heavy rains. Females deposit as many as 2,000 single eggs on the bottom of ponds. The young hatch as tadpoles and transform into adults 6 to 10 weeks later. Frogs are important in helping to control a variety of insects and in turn they serve as a food source for a number of other animals. The barking treefrog and its relatives will remain as a part of our wildlife heritage only if we protect and preserve what few wetland areas still exist in our state.



BLACKSIDE DACE

Scientific Name: Phoxinus cumberlandensis
Family: Cyprinidae
Kentucky Status: Threatened (endemic)
Federal Designation: Proposed Threatened

The blackside dace is a member of the large and widespread minnow family which is the largest fish family with approximately 1500 known species. The family has representatives on every continent except South America and Australia. Approximately 60 of the 229 known fish species in Kentucky are minnows. Unfortunately the term "minnow" is loosely applied to all small fishes; however, true minnows native to Kentucky may be distinguished from other fishes by the absence of spines in the fins, a body covered with smooth-edged scales (cycloid), a scaleless head, jaws without teeth, and only one dorsal or back fin. The blackside dace is known only from the upper Cumberland River of Kentucky and Tennessee where it lives in small, clear, cool mountain streams. Shallow pools with an abundance of places to hide like rocks, undercut banks, or tree roots are the preferred habitat. The species feeds or "grazes" on single-celled algae which are attached to rocks and sticks, and characteristically points its head downward in a position to inspect the stream bottom for food. The blackside dace derives its name from the presence of an intense wide black stripe on both sides which runs the length of the body. The stripe becomes especially dark as the spawning period approaches in late spring. The males also develop golden yellow fins

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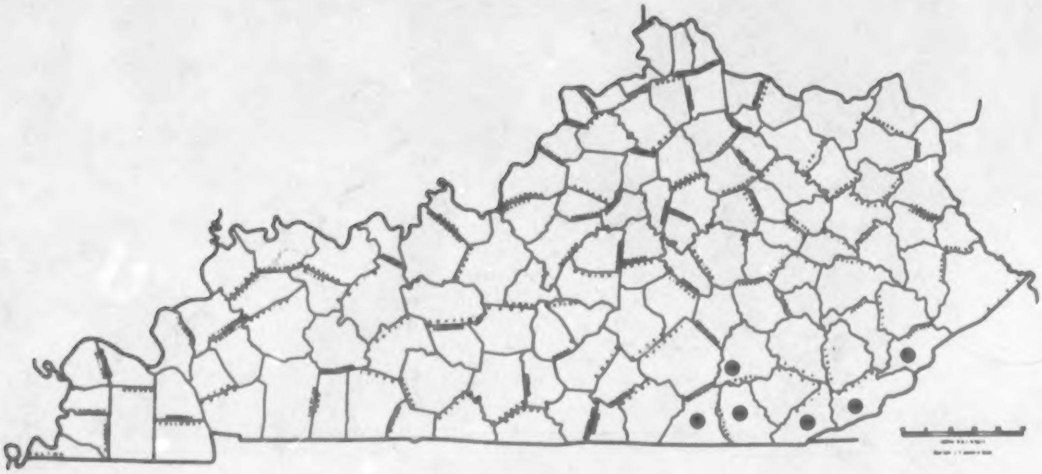
BLACKSIDE DACE (continued)

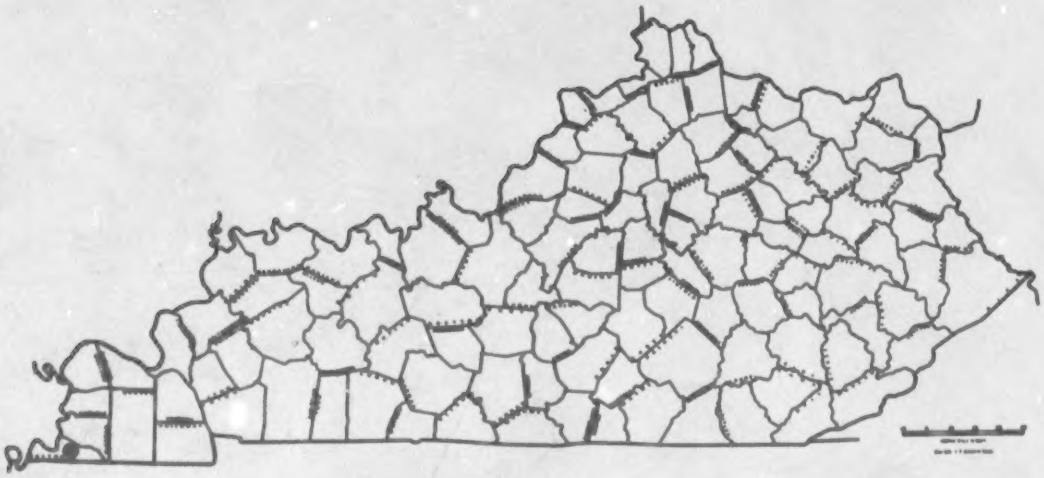
and a bright crimson belly, throat, and mouth at this time in order to attract females. Spawning takes place at the base of small riffle areas over clean gravel. The males congregate in these areas forming shoals of brilliantly colored flashes. The females take position just downstream and periodically swim upstream where they are pinned against small pebbles by the males while spawning takes place. Individuals probably live to 2 to 3 years of age and attain lengths of about 3 inches.



COPPER IRIS

Scientific Name:	Iris fulva
Family:	Iridaceae
Kentucky Status:	Endangered
Federal Designation:	None

Copper iris grows in ponds, swamps, and sloughs on the Gulf Coastal Plain from Georgia to Louisiana, and north in the Mississippi River Valley to Kentucky and southern Illinois. This species flowers in late May and is probably pollinated by bumble bees and hover flies. It releases the seeds in late summer and fall. This species is a perennial which over-winters by storing starch in its thick rhizome structures, which look like roots but are actually modified stems. In Kentucky, copper iris has been found in Fulton County.



CUMBERLAND BEAN PEARLY MUSSEL

Scientific Name: *Villosa trabalis*
Family: Unionidae
Kentucky Status: Endangered
Federal Designation: Endangered

We are all probably familiar with the numerous kinds of sea shells that live in the oceans. But how many of us are aware of the over 550 different kinds of shelled creatures which are called freshwater mussels? They live in streams and lakes throughout the United States. There are over 100 different kinds of freshwater mussels known from Kentucky. This gives our state the distinction of having one of the most diverse assemblages of freshwater mussels on the planet. Freshwater mussels have a soft body that is enclosed by two shells which vary in size, thickness, shape, and color. Hence, they are sometimes referred to as "bivalves". Adult mussels spend their entire lives partially buried on the bottom of some body of permanent water. These creatures eat and breathe by filtering water through siphons that are located in the rear of the animal, a process similar to the way an aquarium filter operates. Foods consist of protozoans, bacteria, and diatoms. Oxygen is absorbed by gills. The head of the mussel is usually buried in the bottom of the lake or stream. Although freshwater mussels have no eyes, they will quickly close up when a shadow is cast over them, and they are sensitive to vibrations as well. The bottom part of the body forms a "foot" or strong muscle which mussels utilize as a limited means of locomotion, though they rarely venture far from the first place they settle down. Reproduction in freshwater mussels is an interesting and unique

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process. Females produce eggs which are stored in pouches that are part of the gills. Sperm are discharged into the surrounding water by the males and the eggs are fertilized as the sperm is drawn into the female siphons. Fertilized eggs develop into larval forms known as glochidia, which are discharged by the thousands into the water. Now is the most crucial time in the life of a freshwater mussel. The glochidia must successfully attach to a fish host or in one case an amphibian host. Some mussels require a specific kind of fish as a host. Most of the glochidia die; however, those that attach themselves to the gills or fins of a fish will feed on their host's tissue for up to six weeks. The host fish is normally unharmed by the infestation of glochidia. When the glochidia develop adult features, they will let go of their host and drop to the bottom of the stream or lake. If they fall in the right place, they may live up to 60 years. Mussels are aged like trees since they also produce yearly growth rings in their shells. During the warmer months, the mussels increase their size while in the winter they become practically dormant. Man has utilized freshwater mussels throughout history for a variety of purposes. Indians readily used them as a food source. In addition, they used the shells for spoons, beads, tools, and in some instances, as money. In the early 19th century, freshwater mussel shells supplied the resource for a multi-million dollar button industry. Today the Japanese use ground up North American freshwater mussel shells for the propagation of cultured pearls. The freshwater mussel depicted on the poster is the Cumberland Bean Pearly Mussel (Villosa trabilis). It is considered an endangered species by Kentucky and the federal government, as are many of

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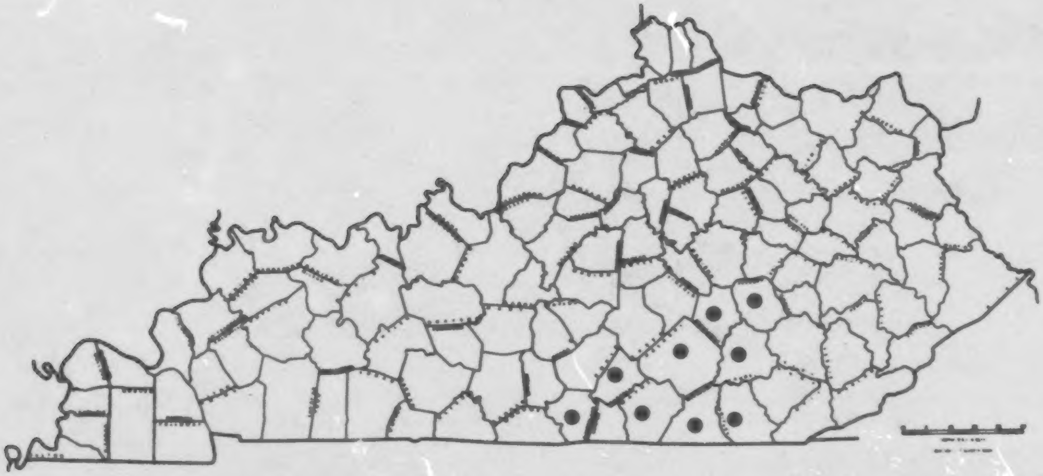
CUMBERLAND BEAN PEARLY MUSSEL (continued)

our state's freshwater mussels. This species lives in streams or rivers that have clean sand or gravel bottoms. It is known from the upper Cumberland River system in Kentucky and from streams in Tennessee and Alabama. The Cumberland River Reservoir has destroyed the habitat of several sites from which this mussel was previously known.



DAISY-LEAF GRAPE FERN

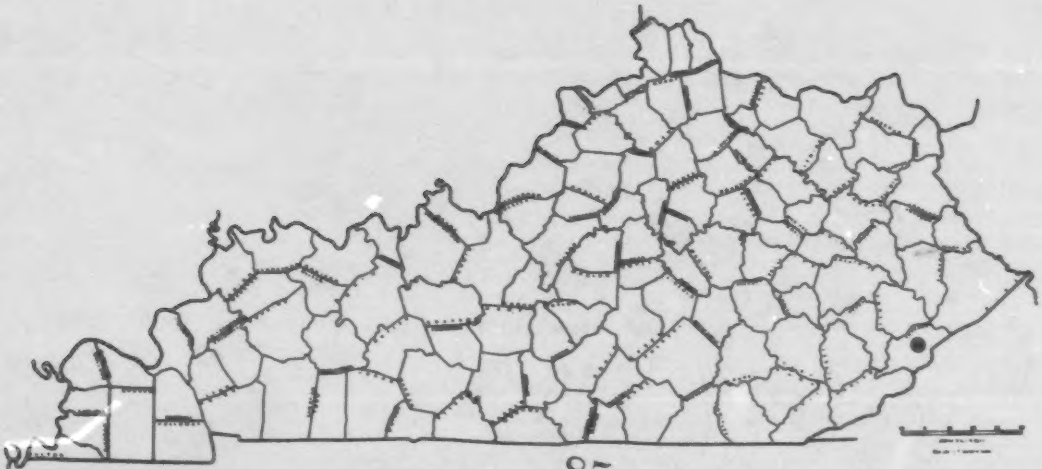
Scientific Name: *Botrychium matricariifolium*

Family: Ophioglossaceae

Kentucky Status: Endangered (peripheral)

Federal Designation: None

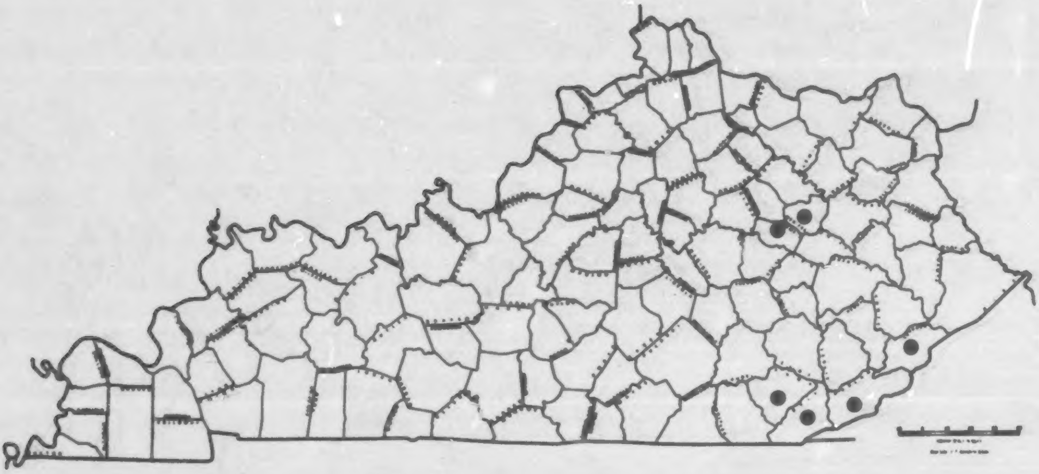
Matricary or daisy-leaf grape fern is a perennial that over winters each year, sending up new fronds from the roots in the spring. It is diminutive in size, usually not over six inches tall. Found in the far north around the world, it occurs in North America in the Rocky Mountains south to South Dakota, and in the mountains of the southeast to Virginia and Kentucky. In Kentucky this fern is known from two individuals found in a rich woods in a ravine on Pine Mountain in Letcher County.



DIANA

Scientific Name: *Speyeria diana*
Family: Nymphalidae
Kentucky Status: None
Federal Designation: None

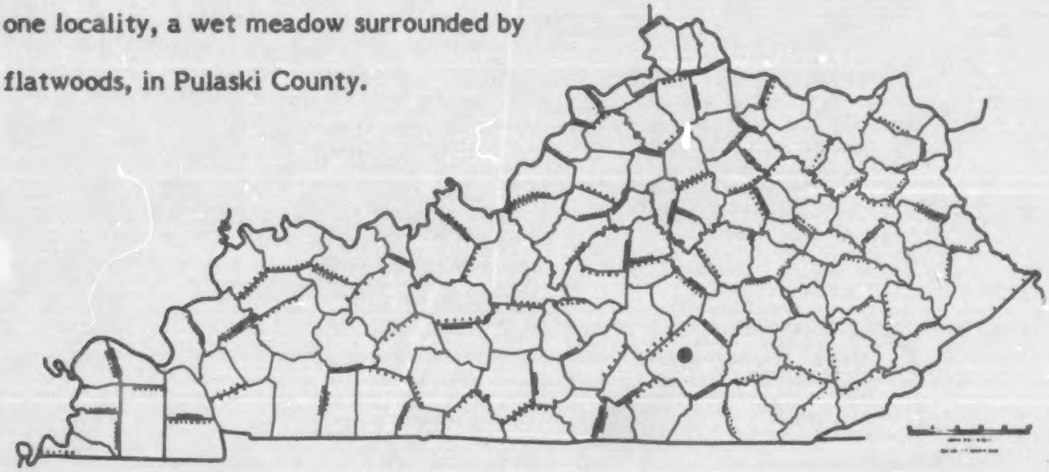
Diana is a handsome butterfly. The color of the female is different from that of the male. In most members of the genus *Speyeria*, both sexes are usually reddish; however, the female *Speyeria diana* is blue and black. This color pattern resembles a similarly colored swallowtail which is distasteful to birds. Thus, the female Diana is protected from becoming a bird's lunch. *Speyeria diana* occurs from Maryland to Georgia and extends west to eastern Oklahoma. Throughout the range, this butterfly lives primarily at the foot of mountains and it is common in many parts of eastern Kentucky. The larval stage (caterpillar) of *Speyeria diana* feeds on violets.



DWARF SUNDEW

Scientific Name:	Drosera brevifolia
Family:	Droseraceae
Kentucky Status:	Endangered (disjunct)
Federal Designation:	None

Dwarf sundew, an annual herb, has leaves which bear numerous hairs tipped with sticky glands. Small insects alighting on its leaves are caught by the sticky tips. Insect movement is thought to stimulate surrounding hairs to bend towards the captive, thus increasing its entanglement. The sticky fluids are digestive juices exuded by the glands which allow the plant to actually absorb necessary nutrients from the insect's body. This species and other related plants commonly live in bogs and marshes where needed nutrients, especially nitrogen, are in short supply. These plants, having evolved an insectivorous or carnivorous mode of feeding, are able to survive in areas otherwise inhospitable. Dwarf sundew is found on moist, sandy, open sites on the Coastal Plain from southeastern Virginia to Texas and in Kentucky, Missouri, and Tennessee. In Kentucky this plant is known from one locality, a wet meadow surrounded by flatwoods, in Pulaski County.



EARLY HAIRSTREAK

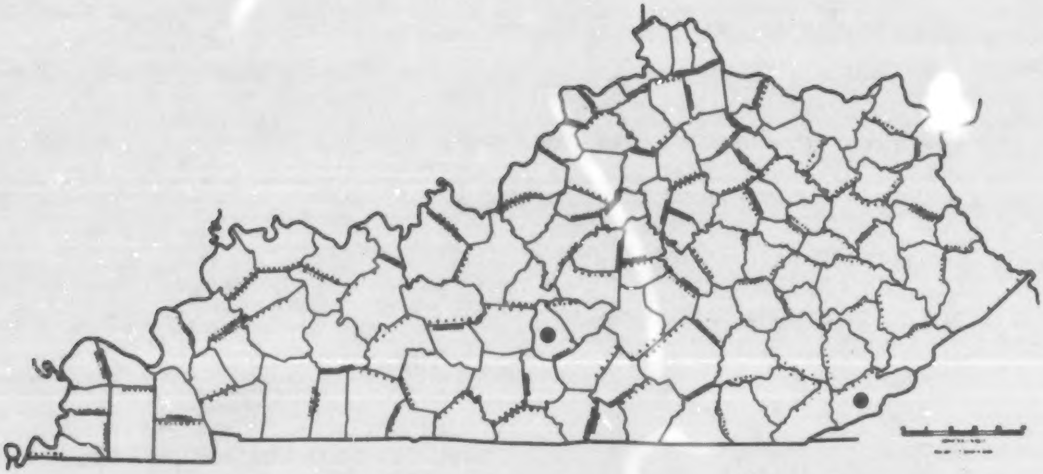
Scientific Name: *Erora laeta*

Family: Lycaenidae

Kentucky Status: None

Federal Designation: None

The early hairstreak lives in eastern Canada and New England and extends down the Appalachian Mountains to Georgia. This butterfly is difficult to find and collect because it flies infrequently. It is considered a great prize among butterfly collectors. In Kentucky, *Erora laeta* has been collected in Green County and from Big Black Mountain and Kingdom Come State Park, Harlan County.



FOUR-TOED SALAMANDER

Scientific Name: Hemidactylium scutatum
Family: Plethodontidae
Kentucky Status: Threatened
Federal Designation: None

Salamanders belong to a group of animals known as amphibians. The word "amphibian" means "living a double" life and refers to an ability to live on land and in the water. For all salamanders, water is essential and many species (including the four-toed salamander) lay their eggs in water. Another group of salamanders called woodland salamanders, however, live entirely on land and do not rely upon open water for breeding purposes. They usually lay eggs in moist earth, damp leaf litter, or in soggy, decaying logs. Salamanders are sometimes mistaken for lizards, but lizards have scales on their bodies and claws on their toes. Salamanders do not have scales or claws. The four-toed salamander belongs to the family of lungless salamanders which breathe through their moist skin. They occur in bogs or shallow ponds with moss-covered logs, roots, and grass clumps over quiet water. The female salamander lays about 30 to 50 eggs under damp moss in March or April and remains with them until hatching. The young are approximately 1/2 inch long when hatched and spend 6 weeks in the water. After reaching 1 inch in length, the young emerge as terrestrial juveniles and mature 1½ to 2 years later. The draining of wetlands for agriculture or urbanization, and the removal of timber from swamp forests are major threats to the continued existence of this species.

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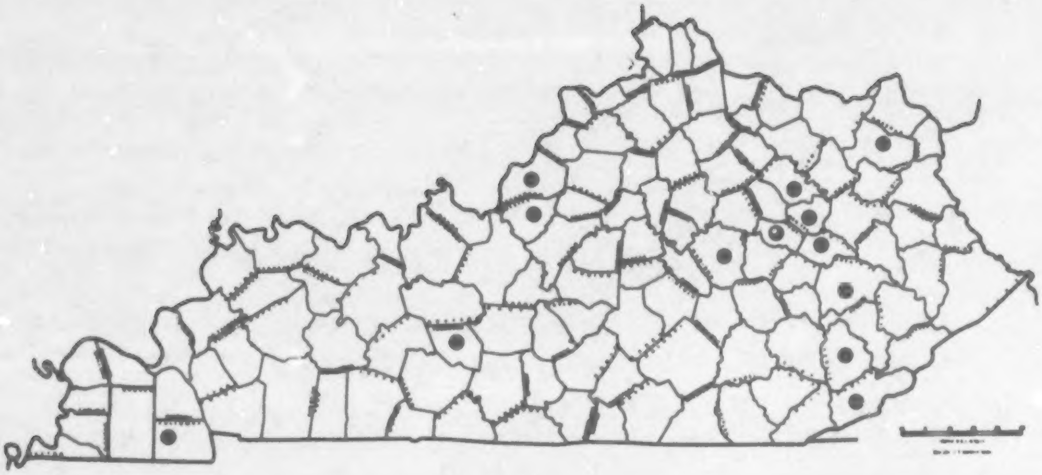
FOUR-TOED SALAMANDER

Scientific Name: Hemidactylium scutatum

Family: Plethodontidae

Kentucky Status: Threatened

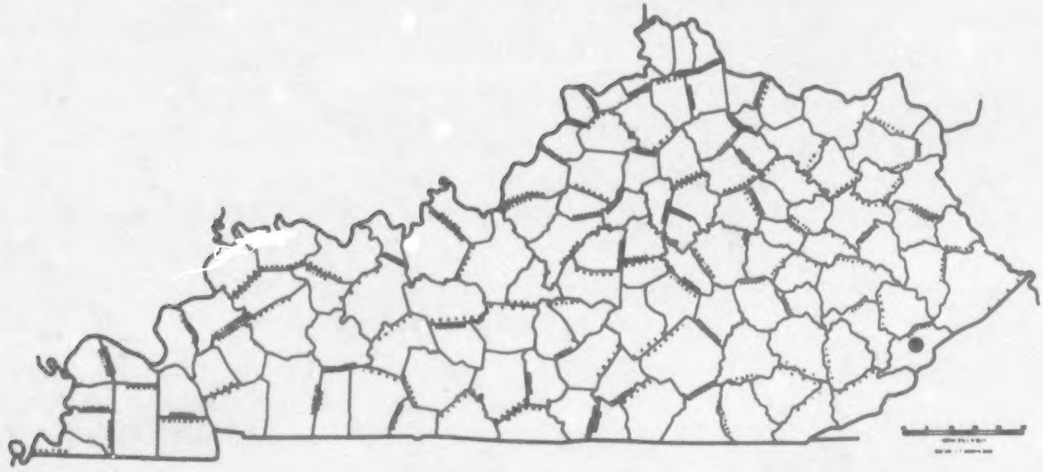
Federal Designation: None



FRASER'S SEDGE

Scientific Name:	*Cymophyllus fraseri*
Family:	Cyperaceae
Kentucky Status:	Threatened
Federal Designation:	None

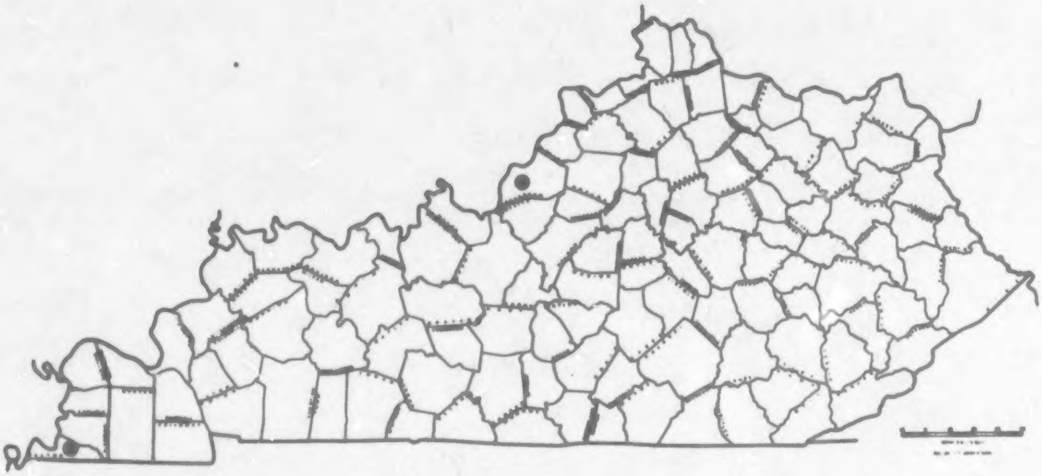
Fraser's sedge is a primitive plant found only in rich mountain forests in the southern Appalachians. It is perennial and evergreen, producing several new leaves each spring as the oldest leaves die. It is easily distinguished throughout the year by its evergreen leathery leaves. This species flowers in May the and the fruit ripens and falls by July. Unlike most sedges, which have insignificant looking flowers and are wind pollinated, this species has white flowers and is apparently pollinated by sweat bees. In Kentucky, it is known only from the steep slopes at a small mountain stream in Letcher County.



GRASS-LEAVED ARROWHEAD

Scientific Name:	*Sagittaria graminea*
Family:	Alismaceae
Kentucky Status:	Endangered
Federal Designation:	None

Grass-leaved arrowhead is a perennial herb that grows in sand or mud in the shallow water of lakes, ponds, and sloughs throughout most of the eastern United States. When grown in water, the submersed leaves are thin, flat, and bladeless. Emergent leaves (above water) are firmer and lanceolate (lance-shaped). This wide-ranging, but rare, species is found from Newfoundland to Minnesota, south to Cuba, and westward to southcentral Texas. In Kentucky it has been recorded from Jefferson and Fulton counties in wet, swampy habitats.



LEAST TERN

Scientific Name:	*Sterna albifrons*
Family:	Laridae
Kentucky Status:	Threatened
Federal Designation:	None

The least tern is probably the smallest tern in Kentucky. A yellow bill and feet, white forehead, and black cap are important features for identification. Least terns are uncommon summer residents near large rivers, lakes, impoundments, and oxbows in southwestern Kentucky. Elsewhere west of the Cumberland Plateau, they are casual spring and very rare fall transients. Least terns arrive in Kentucky generally in mid-May, breed from late-May to mid-June, and leave by mid-October for wintering grounds in the Gulf of Mexico and Central and South America. Nests consist of small, unlined depressions built on sandbars in the Mississippi and Ohio rivers. Broad, flat, open sandy areas devoid of vegetation are selected where the presence of scattered small stones and shells make the eggs difficult to find. Two to three broods of two to three eggs may be raised each year. Hatching occurs in two to three weeks. The young are able to walk or run a few days later and probably fly shortly thereafter. The tern's colonial nesting habit, its tolerance to man and the demand for its delicate plumage nearly resulted in the extinction of this species. Both adults share responsibility for the care and feeding of the young. Each alternately stands over the young with feathers ruffled to provide shade while the mate obtains

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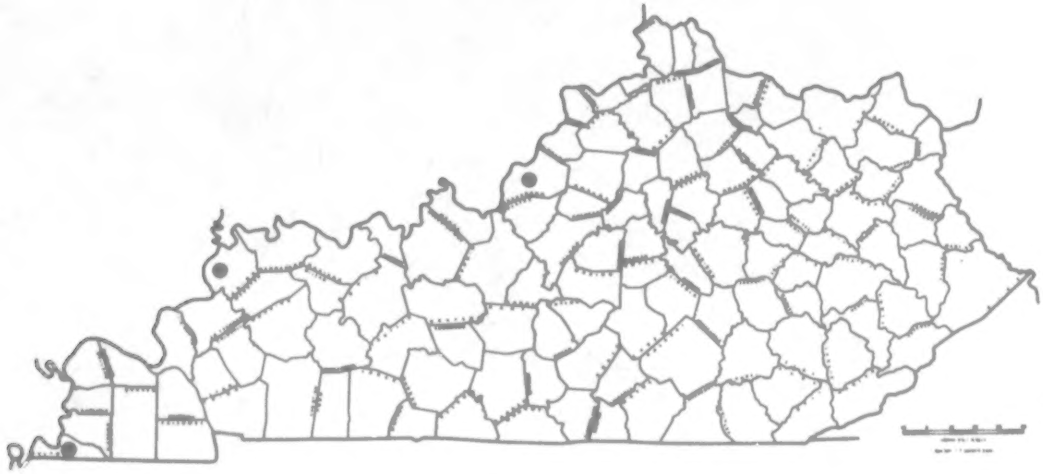
LEAST TERN (continued)

food. Small fish are the primary food although small insects are sometimes consumed. Least terns catch fish by skimming over the water surface until prey is observed. They hover in place, in preparation for attack, and plunge head-first into the water. This plunging behavior has earned the least tern the nickname "little striker". Fish are brought to the nest and offered to the young and the mate. All must be satiated before the hunting mate will eat. In the late summer or fall, upon leaving the nest or after the breeding season, least terns wander widely in Kentucky. They have been known to follow the Ohio River at least to Cincinnati and make limited ventures inland before departing for their southern wintering grounds.



LONG-TAILED SHREW

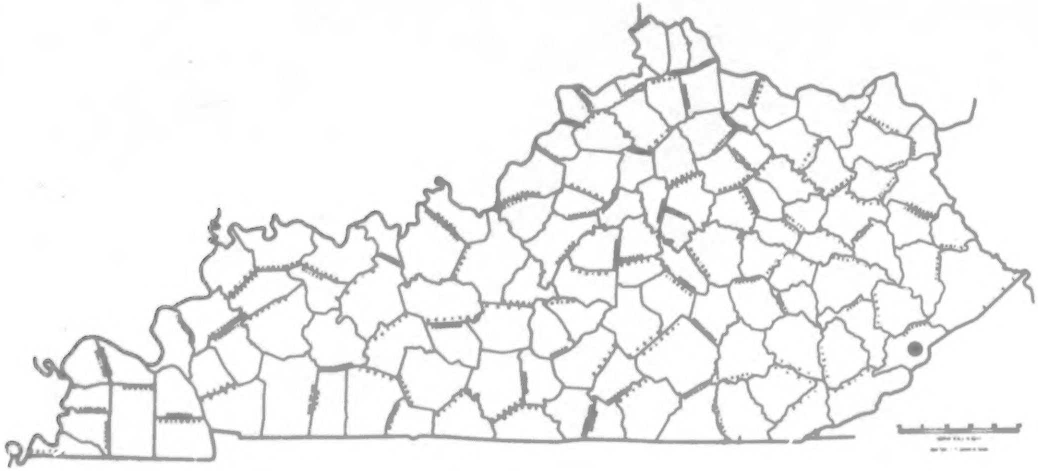
Scientific Name: Sorex dispar

Family: Soricidae

Kentucky Status: Endangered

Federal Designation: None

The long-tailed shrew is an example of a group of mammals called insectivores because they feed primarily upon insects. Moles are also insectivores but are larger and have broad digging feet, whereas shrews are smaller and have narrow running feet. Shrews resemble small mice but possess a long pointed nose and very small eyes. The eyes may be so small that they are hidden in the very soft fur. Shrews are among the smallest of all mammals; some species weigh less than a dime and measure only a few inches in length. Shrews are extremely active year round and must eat frequently or risk dying of starvation. Some shrews consume more than their own weight in food each day. Insects and worms are major food items. In Kentucky, long-tailed shrews live among fallen moss-covered logs and on wet rocky slopes of Pine Mountain in Letcher County. They probably also exist on Cumberland Mountain.



LOUISVILLE CRAYFISH

Scientific Name: *Orconectes jeffersoni*
Family: Cambaridae
Kentucky Status: Endangered (endemic)
Federal Designation: Candidate for Listing

Crayfish, which are also commonly called crawfish and crawdads, are closely related to shrimp. In fact most of these closely related animals live in the oceans as do shrimp. However, the Louisville Crayfish and approximately 320 different kinds of crayfish and shrimp live in freshwater. They live in places such as streams, ponds, lakes, sloughs, swamps, underground water in caves, and even in wet meadows where no open water exists. Crayfish have a more or less cylindrical body with 19 pairs of appendages which are used for a variety of purposes, such as walking, and handling and crushing food. The most conspicuous pair are the enlarged claws used for catching and crushing food and also as formidable weapons, as anyone knows who has carelessly handled a crayfish. Crayfish walk and climb around slowly and can move forward, backward, or sideways. When disturbed the crayfish can rapidly move backwards by flexing its tail. For the most part, crayfish eat aquatic plants although they will eat other animals. Crayfish mate between early spring and autumn. During the mating season the males will seize and attempt to mate with any crayfish that comes their way. When a male seizes another male, a fight will usually insue, sometimes resulting in the loss of the claws. The males can only successfully mate with a female of the same species. Several weeks to several months after mating the female will lay 10 to 700 eggs which will be

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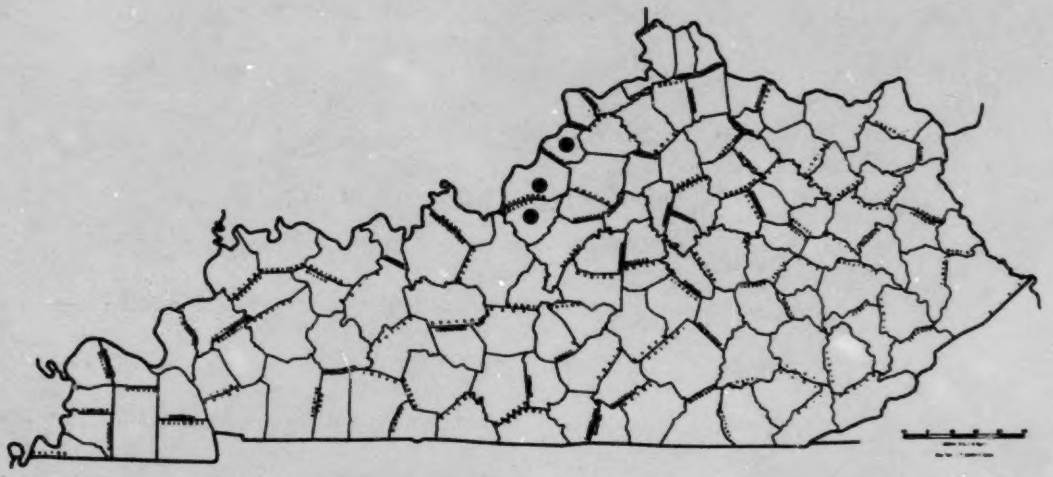
LOUISVILLE CRAYFISH (continued)

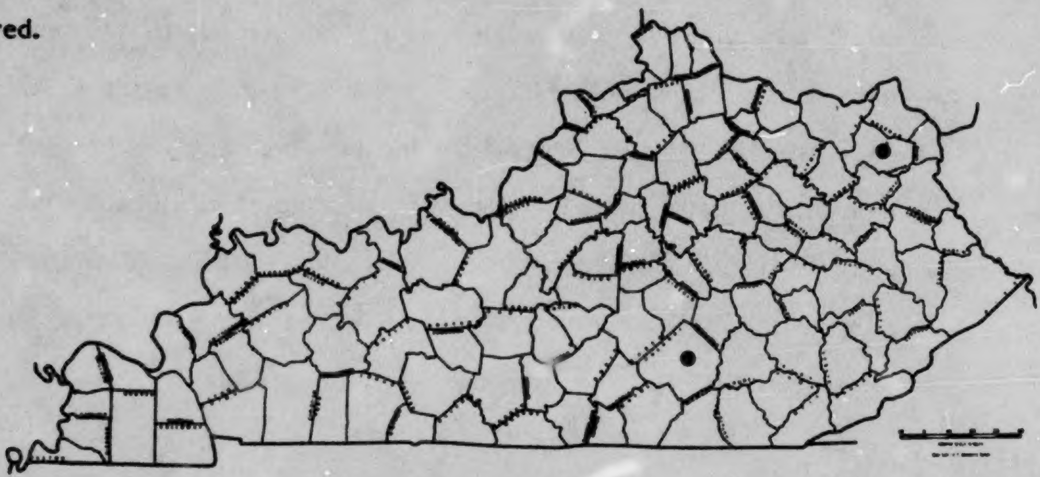
attached to the underside of the abdomen. After the eggs are attached the female is said to be "in berry". The eggs usually hatch in 2 to 20 weeks and the young cling to the mother for several weeks. The normal life span of crayfish is usually less than 24 months and few survive their second winter. During the daytime, adult crayfish remain hidden in burrows or under stones and debris. Between dusk and dawn they move about and feed. Some kinds of crayfish, such as those which live in marshy areas, live in burrows all the time. Others live in burrows only when the stream or ponds dry up in the summer or the weather turns cold in the autumn. A third group of crayfish live continuously in permanent water and do not make burrows. The Louisville Crayfish lives in small streams only in Jefferson, Bullitt, and Oldham counties. This crayfish was first discovered in 1939 in a tributary to Muddy Fork of Beargrass Creek just east of Louisville, and is known to occur only in Beargrass Creek, tributaries of Harrods Creek, and the Pond Creek system. This endemic crayfish (it lives only in Kentucky) is considered to be endangered because the streams in which it lives have been channelized, which increases siltation, and consequently causes poor water quality.



MOUNTAIN MAPLE

Scientific Name: *Acer spicatum*
Family: Aceraceae
Kentucky Status: Threatened (disjunct)
Federal Designation: None

Mountain maple is a tall deciduous shrub or small bush tree native to eastern North America. It is found in cool, moist woods from Newfoundland to Saskatchewan south to Connecticut, Ohio, Michigan and northern Iowa, and in the mountains to North Carolina and Georgia. In Kentucky it is disjunct (separated) from its major range and is predominantly found at the entrances of caves. It is thought that the movement of cool air from these caves modifies the microclimate thereby allowing this predominantly northern plant to survive. The limited distribution and specific habitat requirements of mountain maple in Kentucky make this plant extremely vulnerable to habitat alteration. This rare maple is known in Kentucky from Carter and Pulaski counties with unsubstantiated records from Adair and Breathitt counties. In autumn the leaves of mountain maple turn a brilliant red.



NORTHERN CAVEFISH

Scientific Name:	Amblyopsis spelaea
Family:	Amblyopsidae
Kentucky Status:	Special Concern
Federal Designation:	None

In 1838, the northern cavefish became the first blind cave animal discovered in Mammoth Cave. Today it is known from the Mammoth Cave area of Kentucky northward to southern Indiana. This fish is unusual since it spends its entire life in total darkness. Because of this unique habitat the northern cavefish has functionally lost features such as eyes and skin pigment that are normally found in organisms exposed to sunlight. The cavefish, like a blind person, must rely heavily on its other senses, such as touch, in order to survive. This fish inhabits subterranean streams that have mud-rock shoals and silt-sand pools. It feeds on small aquatic organisms, crayfish, salamanders, and its own young. Breeding occurs during high water from February through April. The females carry the eggs in their gill pouches until hatching and carry the young for 4-5 months, probably to help speed up their growth in cold water. Cavefish have few predators since they live in an isolated environment. It was first believed they lived 7 years, but some now think they may live 20 or more years. The fish attain a length of 5 inches. Although the cave serves to protect the cavefish from predators, it also limits the amount of food available, which is a means of population control. Winter is, of course, no problem for the cavefish since most caves in Kentucky are a constant 57° year round. This species is designated by the American Fisheries Society and the State of Kentucky, as of special concern.

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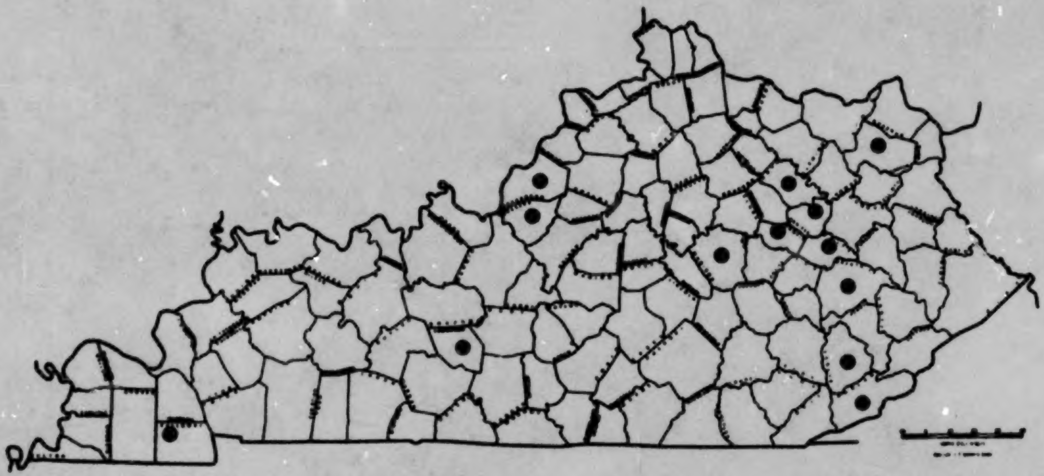
NORTHERN CAVEFISH

Scientific Name: *Amblyopsis spelaea*

Family: Amblyopsidae

Kentucky Status: Special Concern

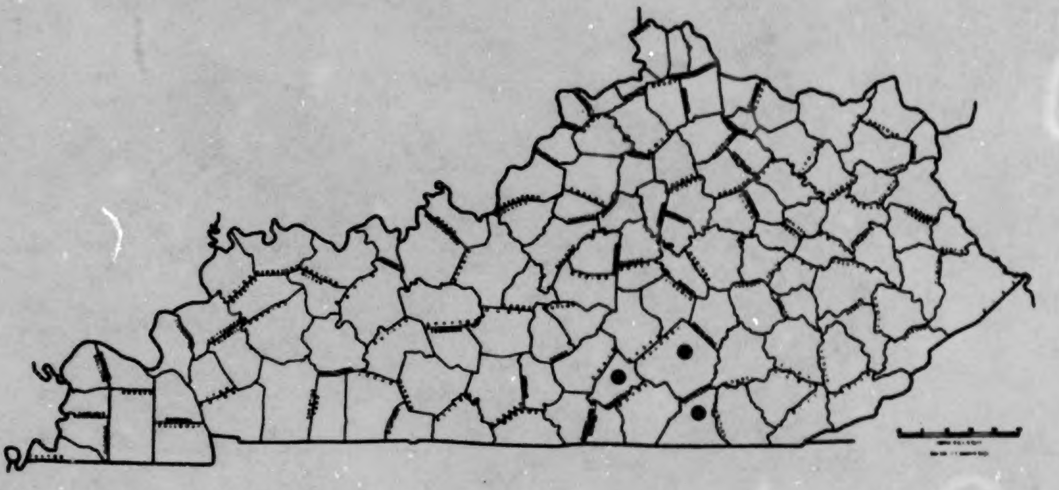
Federal Designation: None



NORTHERN WHITE CEDAR

Scientific Name:	*Thuja occidentalis*
Family:	Cupressaceae
Kentucky Status:	Spcial Concern (disjunct)
Federal Designation:	None

Northern white cedar is an evergreen tree with flattened leaves. It is found across the northern portion of eastern North America and in Canada, and in the extreme northern United States. It occurs at scattered locations southward into northern Illinois, northern Indiana, Ohio, Pennsylvania, West Virginia, Virginia, Kentucky, Tennessee, and North Carolina. This species grows to great size in some of the northern swamps, but in Kentucky it is found mostly on moist limestone bluffs where it is a small to medium-sized tree. It is known from limestone bluffs in Russell and Pulaski counties and from a large sandstone boulder in the Big South Fork, Cumberland River in McCreary County. Northern white cedar is probably wind pollinated as are most coniferous trees.



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PAINTED TRILLIUM

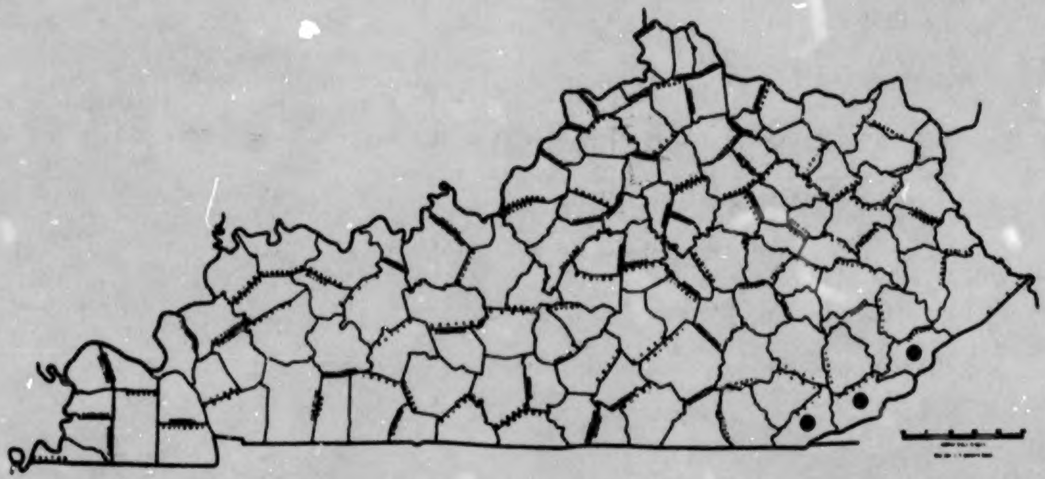
Scientific Name: *Trillium undulatum*

Family: Liliaceae

Kentucky Status: Special Concern (peripheral)

Federal Designation: None

Painted trillium is one of our most showy trilliums. The white petals are wavy-edged marked towards the base with a red or purplish blotch and streaks. This perennial herb is found in rich mountain woods from Quebec to eastern Manitoba and south to Wisconsin, Michigan, Pennsylvania, and New Jersey. It occurs south to North Carolina, Tennessee, and Georgia in the mountains. In Kentucky painted trillium is found in the mountainous areas of Bell, Harlan, and Letcher counties.



PEREGRINE FALCON

Scientific Name: *Falco peregrinus*

Family: Falconidae

Kentucky Status: Endangered

Federal Status: Endangered

The long pointed wings and long tail mark the peregrine falcon as a member of the family Falconidae; it is one of the most streamlined and fastest of all fliers. Its size (close to that of a crow), a dark cap and "side burns", and large feet are characteristic of the species. The peregrine falcon is a rare transient along large rivers and reservoirs in Kentucky. It is more common in open country with water and high cliffs. The peregrine falcon may winter in Kentucky in small numbers, mainly near large bodies of water west of the Cumberland Plateau. The subspecies *F. p. anatum* formerly nested along the fault escarpment of the Cumberland Mountain, the western edge of the Cumberland Plateau, and the Kentucky River Palisades. Nesting also occurred in the Louisville and northern Reelfoot Lake areas. Although no recent evidence of breeding in Kentucky has been reported, family groups of two adults and three young have been observed near the Kentucky-Virginia border in early June, suggesting a late April or early May nesting period. Nests are typically built on high cliffs although nesting in trees has been reported. Nests on cliffs consist of slight hollows about one-half inch deep and 12 inches wide, containing rocks, twigs, and food remains. Three to four (occasionally five to seven) eggs are laid each year. The eggs are creamy white to pale pink and have fine dots of rich brown or red. A second or third

(continued next page)

set may be laid if the first clutch is lost. The 33 to 35 day incubation period primarily demands the female's attention; however, both parents hunt for food. The fledgling young may remain with the parents for one month after leaving the nest. The peregrine falcon feeds on birds ranging in size from warblers to mallard ducks. The kill is accomplished on-the-wing by a forceful blow with its sharp talons, administered after a spectacular dive or "stoop" during which the bird may reach speeds in excess of 100 miles per hour. The prey may be captured in the air or recovered from the ground. Ordinary level flight speed ranges from 48 to 62 miles per hour. This hunting ability and spectacular aerial performance has made the peregrine falcon the choice hunting bird of nobility since 2000 B.C. What has been interpreted as playful behavior - chasing, bumping, and paired aerial gymnastics - has been observed to involve several falcons at one time. Harrassment of prey species without causing injury has also been noted. From a fairly large and stable nationwide population in the mid-1940's, the peregrine falcon population has been reduced to perhaps 200 breeding pairs in the continental U.S. This precipitous decline has been attributed to decreased reproductive success, caused by eggshell-thinning from the ingestion of food contaminated with chlorinated pesticides. Habitat destruction and disturbance has also contributed to its decline. As a result, the peregrine falcon was added to the Endangered Species List in 1970. Current efforts to re-establish the species thoughout its former range have met with some localized success.

(see map next page)

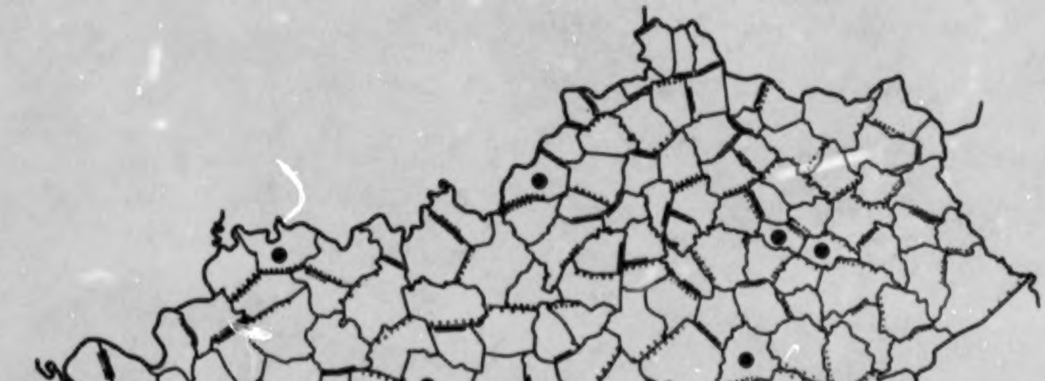
PEREGRINE FALCON

Scientific Name: Falco peregrinus

Family: Falconidae

Kentucky Status: Endangered

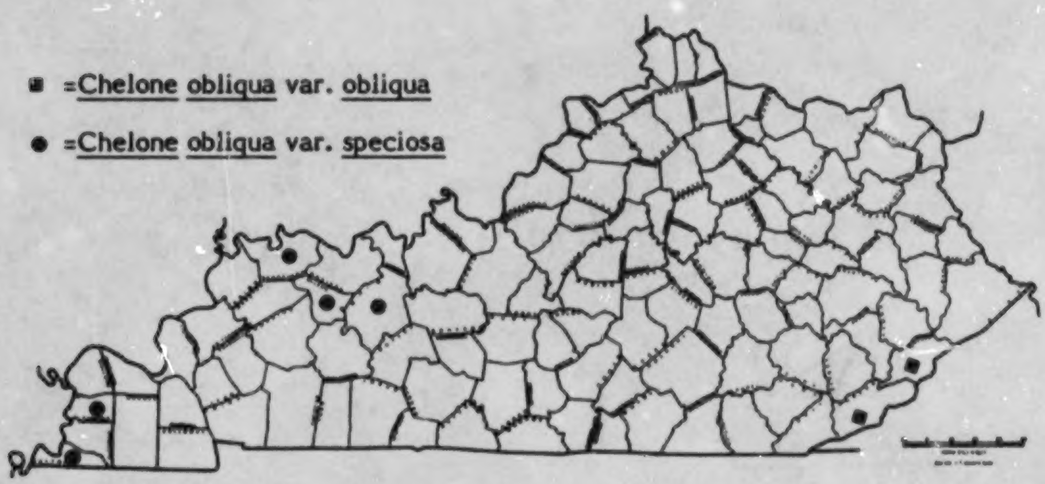
Federal Status: Endangered



PINK TURTLEHEAD

Scientific Name:	Chelone obliqua
Family:	Scrophulariaceae
Kentucky Status:	Endangered, Threatened
Federal Designation:	None, Candidate for Listing

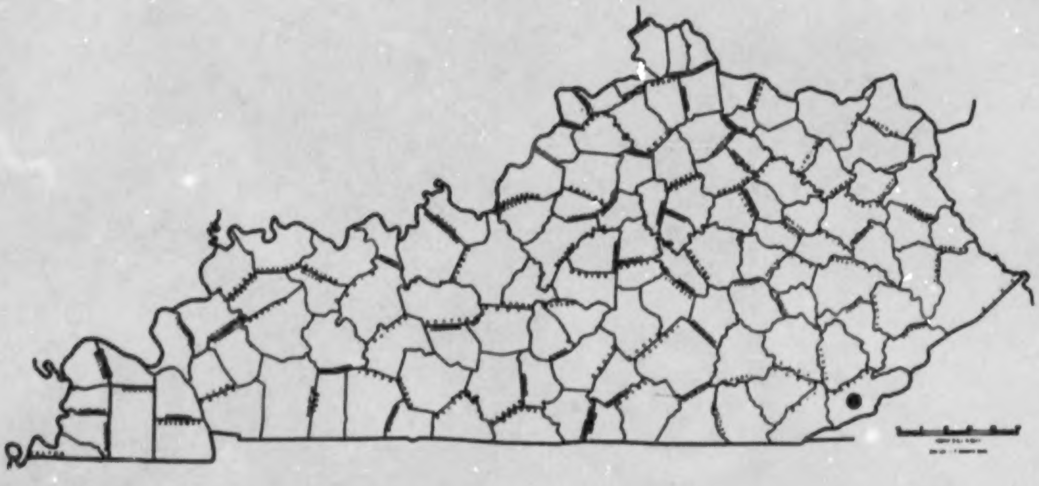
Pink Turtlehead, a pink-flowered perennial herb, is represented by two varieties in Kentucky. Chelone obliqua var. obliqua is found from Mississippi to Florida and north in the central Piedmont and the mountains to Maryland. This variety is known from only two localities in eastern Kentucky and is considered endangered. Chelone obliqua var. speciosa is found in wet, rich woods and swamps from southern Minnesota, south to Arkansas. In Kentucky this variety is restricted to wet woods and swamps in the western counties, and is believed to be rare in the United States. The loss of wetland habitat, due to clearing and drainage, is a prime threat to this plant's existence. This plant is considered threatened in Kentucky and is being considered as a candidate for listing by the United States Fish and Wildlife Service.


■ =Chelone obliqua var. obliqua
● =Chelone obliqua var. speciosa

PURPLE FRINGED ORCHID

Scientific Name:	Platanthera psycodes
Family:	Orchidaceae
Kentucky Status:	Endangered
Federal Designation:	None

Purple fringed orchid is a perennial herb found over much of the northern portion of the eastern United States and down the Appalachians to Tennessee and North Carolina. It flowers in June and is pollinated by the spicebush swallowtail and other large butterflies. Its habitat is open, moist meadows and moist woods. In Kentucky it is known only from the slopes of our highest mountain, Big Black Mountain in Harlan County, and is found in open or shaded areas along small streams.



RED AZALEA

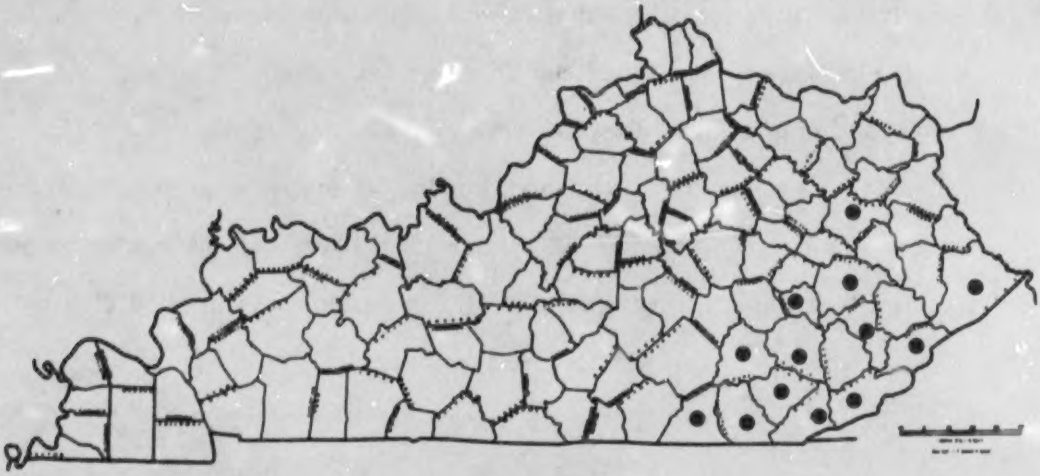
Scientific Name: *Rhododendron bakeri*

Family: Ericaceae

Kentucky Status: None

Federal Designation: None

Red azalea is a deciduous, woody shrub typically found on the slopes and tops of sandstone ridges in open oak woods and in clearings. This species of azalea is always red or red-orange in flower instead of yellow or yellow-orange as the flame azalea, *Rhododendron calendulaceum*, which is more commonly found in Kentucky. Another distinguishing characteristic is that the red azalea flowers 5-6 weeks after the leaves have unfolded, whereas flame azalea flowers at the same time the leaves are opening. Red azalea is found in mountain woods of eastern Kentucky and western West Virginia to eastern Tennessee. This species in eastern Kentucky has been found in 13 mountain counties in Eastern Kentucky.



RED-COCKADED WOODPECKER

Scientific Name: *Picoides borealis*

Family: Picidae

Kentucky Status: Endangered

Federal Designation: Endangered

This small woodpecker can be identified by its "zebra-like" black and white stripes on its back, a black cap, and a white cheek patch. This species is a permanent resident of Kentucky and inhabits pine-oak woods on the western edge of the Cumberland Plateau. Its preferred nesting sites are cavities excavated in living pine trees afflicted with red-heart fungus disease. The nesting hole is usually bored slanting upward for several inches straight through into the softer heart of the tree, then downward for 8 inches to a foot or more. The nest cavity is gourd-shaped and the eggs are laid upon fine wood chips and debris in the bottom of the cavity. The adults customarily drill numerous small holes in the bark around the entrance hole. Resin seeps from these small holes and perhaps helps to deter hungry snakes. Foods consist primarily of larvae of various wood-boring insects, although beetles and grubs of other kinds as well as ants, grasshoppers, crickets, and caterpillars are frequently eaten. This bird is not destructive to orchards or crops and only utilizes diseased trees as its home. It therefore should be regarded as wholly beneficial and worthy of complete protection. Due primarily to recent habitat destruction and alteration, its numbers have declined. It was accorded federal endangered status in June of 1970.

(see map next page)

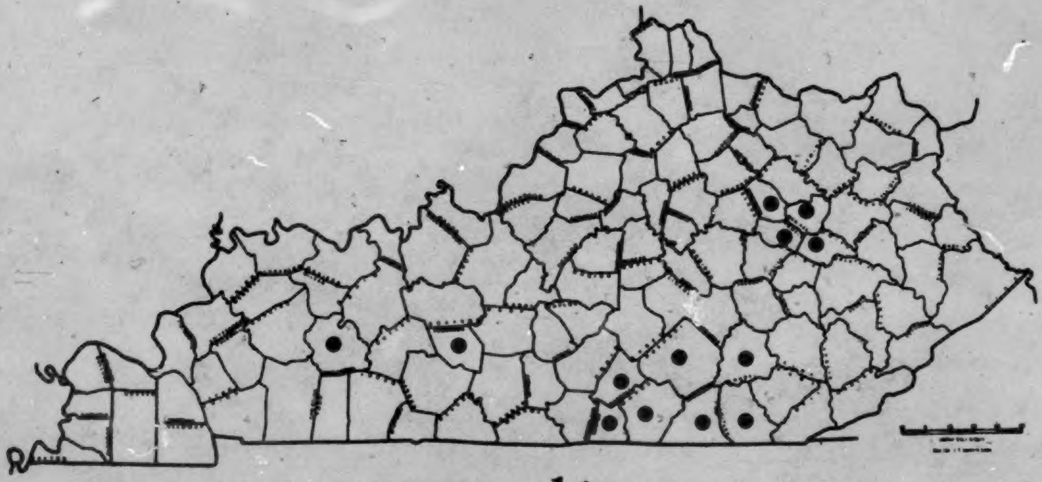
RED-COCKADED WOODPECKER

Scientific Name: Picoides borealis

Family: Picidae

Kentucky Status: Endangered

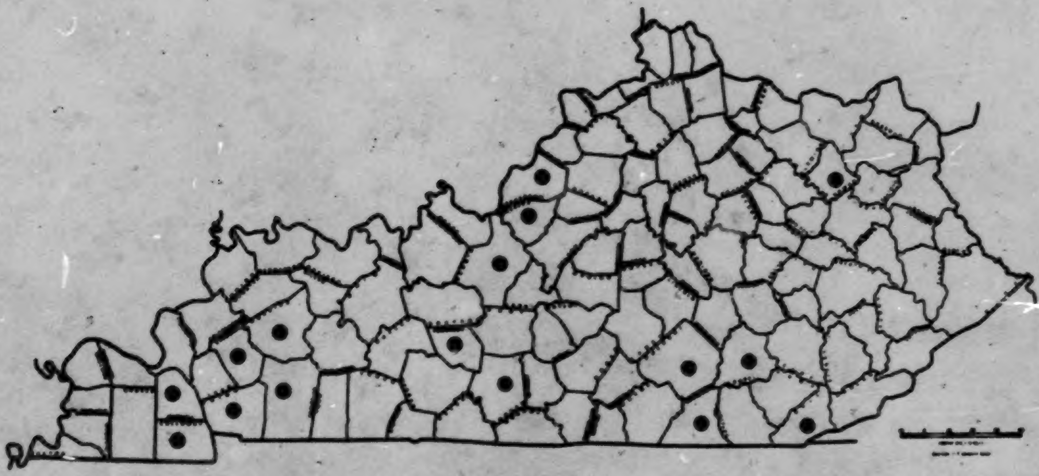
Federal Designation: Endangered



SCARLET SNAKE

Scientific Name: *Cemophora coccinea*
Family: Colubridae
Kentucky Status: Undetermined
Federal Designation: None

The handsome scarlet snake is a small slim species with red, yellow, and black crossbands. Although superficially similar to the poisonous coral snake, this snake is easily recognized by its plain white belly, red snout, and red bands that are much wider than the black ones. Most individuals do not bite, even when first handled. This snake may be found burrowing in leaf mold or rotten logs. Various soil types are also inhabited but sandy or moist loam soils seem especially preferred. Its diet consists of lizards, small snakes, mice, insects, slugs, salamanders, and especially reptile eggs. Two teeth in the back of its mouth are enlarged and may serve to puncture the eggs. Snakes play an important role as members of our wildlife. They help to control rodents and other pests and in turn serve as food for other animals.



SOUTHERN TWAYBLADE

Scientific Name:	*Listera australis*
Family:	Orchidaceae
Kentucky Status:	Endangered (peripheral)
Federal Designation:	None

Southern twayblade is a delicate greenish-purple flowering perennial herb. This plant is uncommon but is widely distributed, occurring in Quebec, eastern Ontario, New York, New Jersey, and from South Carolina south to Florida, and west to east Texas. In the northern portion of its range it grows in sphagnum moss around the edges of bogs. In the south it grows in the dense shade of wet deciduous woods. In Kentucky it has been found in a moist, wooded ravine in Hickman County. The small size and inconspicuous nature of this plant makes it quite difficult to see.

TOWNSEND'S BIG-EARED BAT

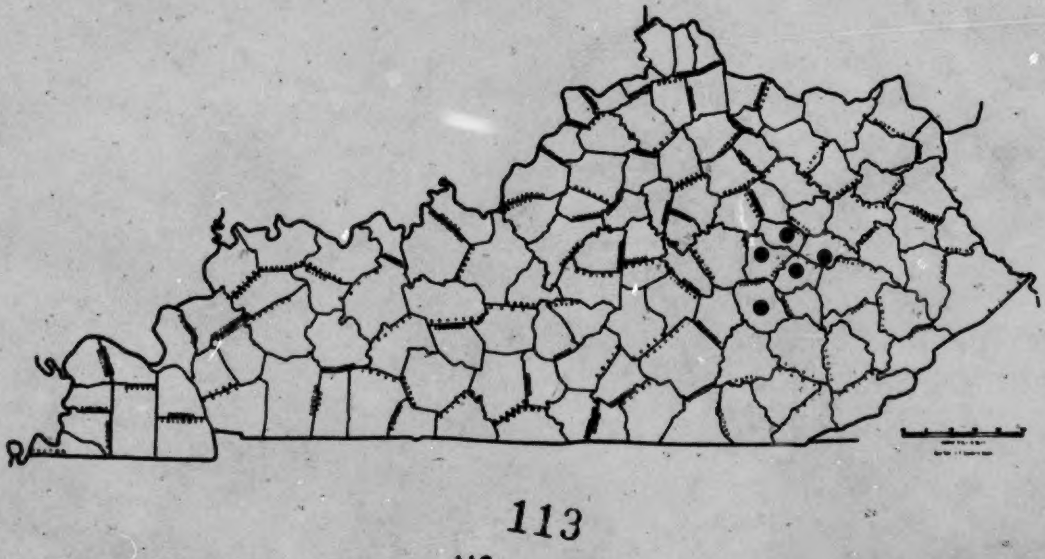
Scientific Name: Plecotus townsendii

Family: Vespertilionidae

Kentucky Status: Endangered

Federal Designation: Endangered

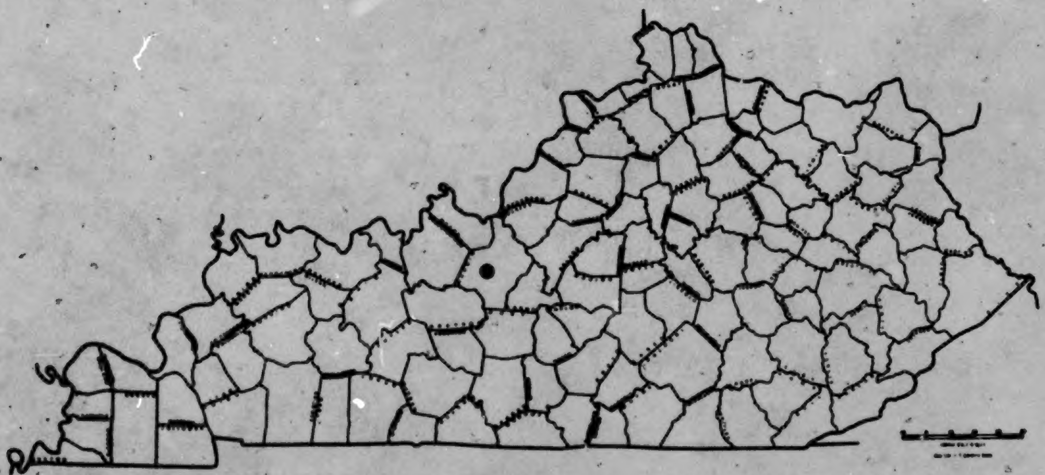
Bats are the only group of mammals capable of true flight. When flying, bats emit high-pitched sounds that bounce off objects as echoes and enable the bats to locate food (flying insects) and avoid obstacles. Most bats eat large amounts of flies and mosquitoes and are therefore beneficial to man and should not be harmed. Townsend's big-eared bat is a colonial cave-dwelling species. Breeding usually occurs in the winter roosts. Nursery colonies form in the spring and the single young are born from late May to early June. In Kentucky, this species is known from only a few sites in the east central section of the state. They are intolerant of even the slightest disturbance and will abandon their caves (and young) to avoid any intrusion. This species may soon vanish as a part of our fauna if we do not make efforts to protect and preserve caves used by them.



WHITE LADY SLIPPER

Scientific Name:	Cypripedium candidum (White Lady Slipper)
Family:	Orchidaceae
Kentucky Status:	Endangered (disjunct)
Federal Designation:	None

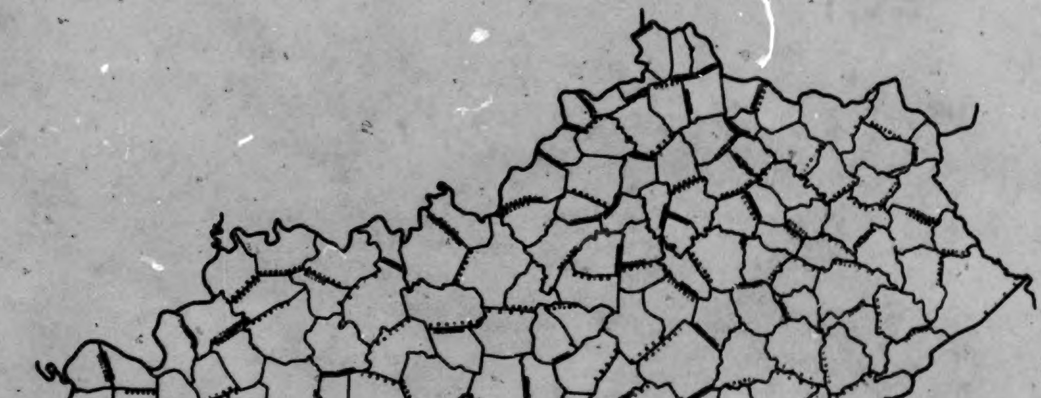
White lady slipper is a perennial herb which grows in full sunlight in moist, calcareous prairies and fens. This white-flowered lady slipper is found from New York and New Jersey westward to South Dakota, and south to Missouri and Kentucky. In Kentucky it was originally reported from the "Barrens" and the only known existing location is in Hardin County at the edges of a glade prairie. This orchid is rare throughout its range in the United States.



WILD RICE

Scientific Name:	Zizania aquatica
Family:	Poaceae
Kentucky Status:	Endangered
Federal Designation:	None

Wild rice is a large grass which grows at times to 10 feet in height and is found in shallow water along lakes and streams. Wild rice occurs from Maine to North Dakota and Idaho and south to Kansas, Louisiana, and Florida. It sometimes covers acres of shallow water in the northern states. This species flowers in mid to late summer and releases the seeds in late fall. The seeds of wild rice are edible and were extensively used by the Indians as a food source. Wild rice has become rare due in part to water pollution. It is known in Kentucky from near Reelfoot Lake and from a lake in the "Barrens".



WOODLAND JUMPING MOUSE

Scientific Name:	Napaeozapus insignis
Family:	Zapodidae
Kentucky Status:	Special Concern
Federal Designation:	None

This colorful rodent has large hind feet and a tail longer than its body. Its jumping ability often enables it to escape would-be predators. Single bounds may measure from ten to twelve feet. The hind feet provide propulsion while the tail gives balance and may also be used to steer or brake. Its tri-colored coat is brown on the back, orange along the sides, and white underneath. The long tail has a white tip. The coat color pattern provides fine camouflage in its preferred habitat in cool, moist, high-elevation woodlands of the northeastern United States. This mouse is most active at night and feeds mostly upon seeds of jewelweed (Impatiens sp.) and fungal spores (Endogone sp.). The front teeth (incisors) of this mouse (and of all rodents as well) grow continually throughout life, and even throuhh feeding upon seeds wears down the incisors remain sharp and of proper length. The woodland jumping mouse spends nearly half of its life in hibernation. Approximately six months of every year, from October to April, are spent in dormancy in nests of leaves and grass situated in brush piles or located several inches underground. Breeding occurs in April or May and the young are born in June. Litter sizes range from two to seven although the average is four or five. A second litter may be produced in August or September. These mice provide a partial food source for predatory birds, reptiles, and mammals.

(see map next page)

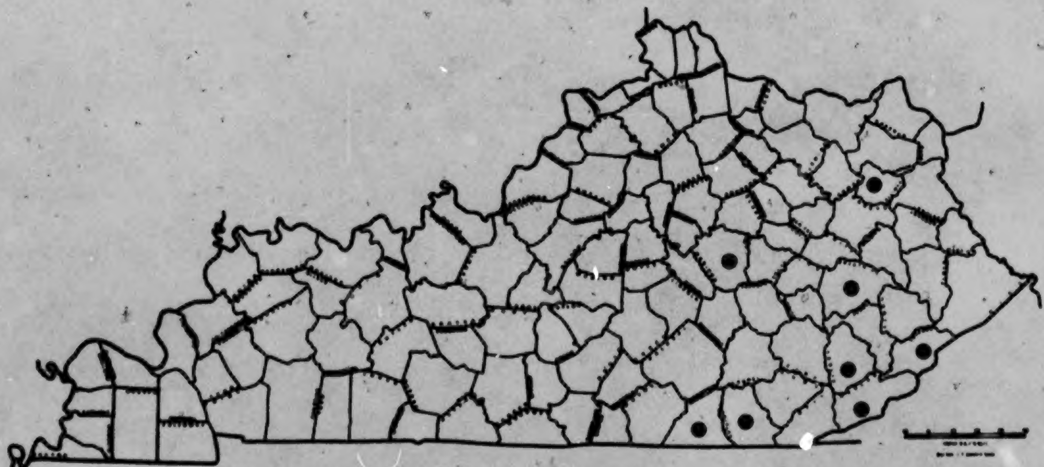
WOODLAND JUMPING MOUSE

Scientific Name: *Napaeozapus insignis*

Family: Zapodidae

Kentucky Status: Special Concern

Federal Designation: None



YELLOWISH GENTIAN

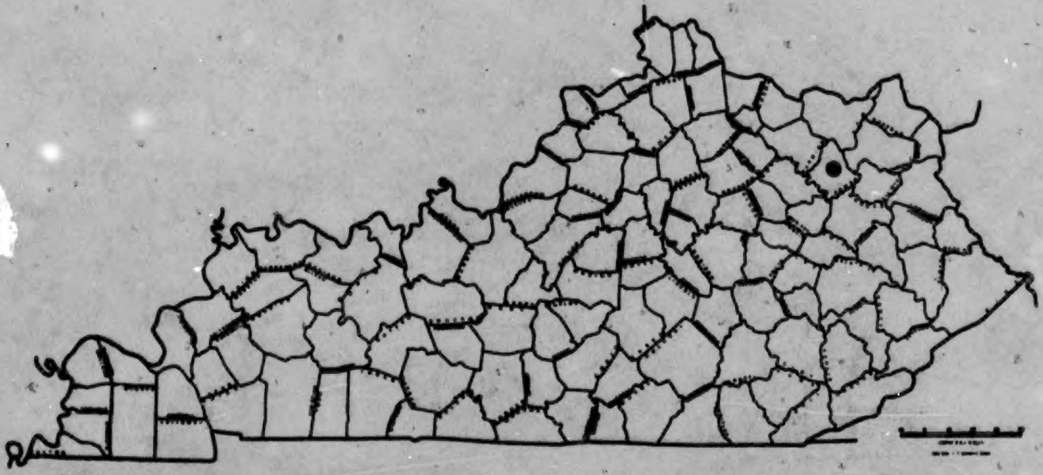
Scientific Name: Gentiana alba

Family: Gentianaceae

Kentucky Status: Endangered

Federal Designation: None

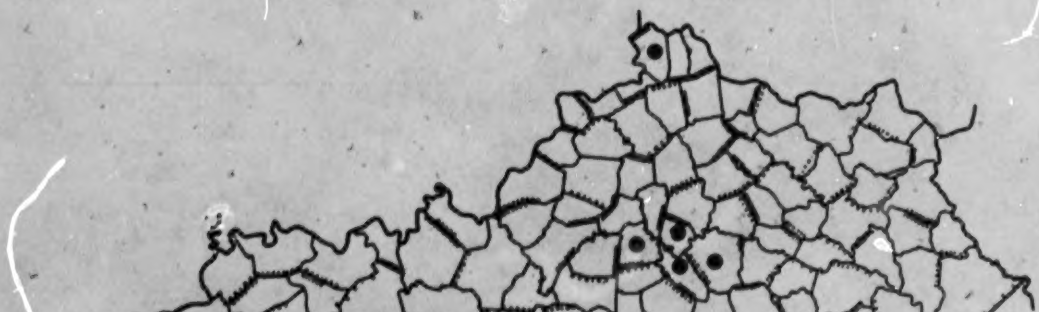
Yellowish gentian is a prairie plant. It is found from central Minnesota to southern Michigan, south to eastern Kansas, and northwestern Arkansas. It is scattered in the east to southern Ontario, eastern Pennsylvania, West Virginia, and western North Carolina. In Kentucky it has been found in a prairie remnant in Rowan County. The yellowish gentian flowers in September and is pollinated by large bumble bees who force their way into the flowers which remain partly closed at the tip. This species grows approximately two feet tall and usually occurs in small scattered clumps. It is a herbaceous perennial and dies back to a rosette of leaves at the base of the plant each year.

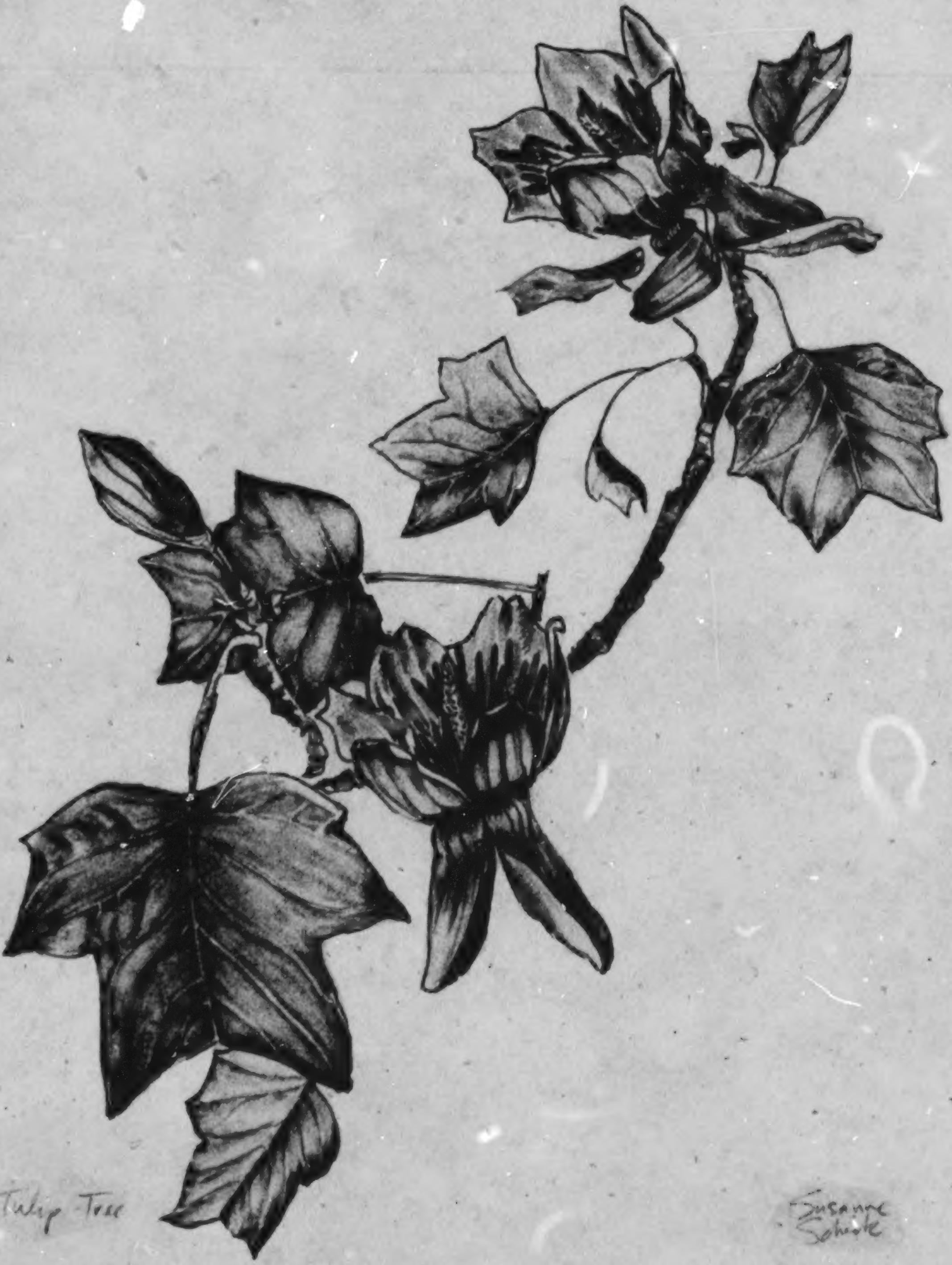


YELLOW-WOOD

Scientific Name:	Cladrastis kentukea
Family:	Fabaceae
Kentucky Status:	Threatened
Federal Designation:	None

Yellow-wood is a small to medium-sized tree which grows on limestone ledges, bluffs, and in rich mesophytic forest (moist woods with many tree species). This tree is infrequent but often locally abundant in the areas where it does occur. Yellow-wood has a scattered distribution in the southeast with its main distribution in the southernmost part of the Appalachians and on the Ozark Plateau. Yellow-wood flowers in May and is probably pollinated by small bumble bees and honey bees. In Kentucky, yellow-wood is found scattered in rich mesophytic forests in the southern portion of the Cumberland Plateau, on limestone bluffs of the Kentucky River, in the eastern part of the Bluegrass, on bluffs of conglomerate rock (rocks and pebbles cemented together) in Boone County, and on slopes of wind-blown soil (loess) bluffs in Fulton County in southwestern Kentucky.





Tulip Tree

Susanne Schulte

THE GREAT OUT-OF-DOORS

INTRODUCTION

The real heart of environmental education is the experiencing of nature. Outdoor activities are essential in this regard. Whether it be the schoolyard, one's own yard, or a nature preserve, some activities should be conducted outside the classroom. Several activities designed to introduce students to the natural world are suggested in this section. The following sections and objectives are included:

Section I - Mother Earth

Objectives: Investigate the various components of soil

Define decomposition, differentiate between organic and inorganic materials

Recognize the various fungi and mushrooms found in an area. Collect various samples of mushrooms and make spore prints

Section II - Microhabitats

Objectives: Write or draw an original composition which illustrates an outdoor awareness experience. Construct a terrarium using materials collected on a nature walk.

Investigate animals and plants found in a rotten log. Organize a list of organisms which are found.

Investigate various plants for signs of insect life. Collect various examples of plants which are used for insect homes. Compile a list of essential items needed for survival.

Observe, discuss and distinguish between the various parts of a tree.

Section III - The Pond

Objectives: Collect organisms from a water community and draw examples of various components which make up a water community.

Observe and identify plants and animals that live in a pond community. Construct a food web of a pond community.

Section IV - Animal Behavior

Objectives: Investigate the night behavior of various animals.

Determine how (or if) insect night life is affected by light and temperature.

Section V - Mapping

Objectives: Construct a simple map of an outdoor area.

Mapping, using a compass.

MATERIALS FOR OUTDOOR EXERCISES

Binoculars

Why can't I see anything besides black blotches? Why is half of my vision out of focus? Use of binoculars takes practice. First, move the eye piece closer or farther apart so that both eyes are seeing without blotches. Then close the left eye and adjust the focus-ring around the right eye-piece until the right eye is seeing clearly. With both eyes open, adjust the focus ring until vision is clear. If you can't find a small object or a bird with the binoculars, find it without the binoculars, locate it next to a prominent object such as a tree trunk or branch, then find the prominent object with the binoculars and locate the bird. It takes practice.

Hand Lens

Use for looking at small objects or details on large objects. Much is missed by scanning quickly, look again, more closely.

Jars, Pans and Bags

Plant samples taken from the field will keep longer in a plastic garbage bag. Aquatic specimens can be seen in a glass jar. Be sure to cover. Be careful - glass jars can break. Flat, white enamel-bottom pans are useful when observing aquatic specimens in the field. The white enamel background makes it easier to see details.

Kill Jars

Place a small amount (1/2") of sawdust in a widemouth glass jar. Pour a little plaster of paris on top of the sawdust and make four small holes before it drys. When this is dry, soak the plaster with chloroform or ethyl acetate. Be sure to keep the jar covered at all times.

Nets

Important extensions of the arm and hand can be easily made. Sweep-nets are basically butterfly nets. Sew a triangular piece of cheese-cloth or mesh up one side, make an open end sleeve and run a coathanger (bent in a circle) through the sleeve; attach net to old broom handle. Dip nets can be made by attaching a kitchen sieve to an old broom handle. Sweep nets are used in a field to catch insects in the grass. A back and forth sweeping motion through the vegetation will catch insects which would otherwise fly or jump out of reach. Dip nets can be scooped through the water or into the pond-bottom muck.

Notebooks

It is a good idea to have a pocket-sized notebook for recording field observations, weather conditions, measurements. This sort of information may not seem important at the time, but later reference to environmental conditions may provide answers, or if the experiment is to be repeated, or compared to a similar one, measurements and calculations may prove helpful.

Thermometer

Always read marking so that the mercury is level with your eye. Looking up or down on the thermometer can distort the reading by 2° or so.

Tree Rings

Tree ring analysis is more easily studied with some tree species than others. Soft woods such as pines, are easy to do. Pines also demonstrate tree growth patterns. Their rings are easily counted and reflect environmental conditions according to the spacing of the rings.

THE GREAT OUT-OF-DOORS

SECTION I: MOTHER EARTH

ACTIVITY 1: Soil Investigation

OBJECTIVE: Investigate the various components of soil

MATERIALS: Hand trowels - one per group

Divide class into small teams and assign them to a square foot of soil in a forest. Before investigating deeply into the soil, observe the conditions of the study plot. How does the soil feel? Moist and cool or dry? Does the study plot get full sun or is it shaded during the day? Has it rained recently? How large are the plants living in your plot? Do you see any insects or other signs of animal life?

Where does the rain go when it falls onto the soil? What does an earthworm do underground? Where do plant roots go? Where is a chipmunk's burrow? A lot is happening underground. As you begin investigating the soil layers, think of the soil as a sponge. There are tiny thread-like air channels between the soil particles. Earthworms make tunnels, churning up the soil. Roots force their way through the ground, making passages. Just as a sponge soaks up water, soil absorbs water and air. Dust particles in the air are collected by rain and returned to the soil.

Very carefully remove the first top inch of soil from the study plot and place it to the side. Sift through the soil just removed and list what you've found. Repeat for the next inch of soil.

These top soil layers include dead and decaying materials from last year's plant and animal growth. They are termed "litter". The dark, compacted layer beneath is humus. This layer supplies minerals and nutrients to the plant community. How does the texture of this layer compare with the litter? Can you find examples of root systems? What color are the roots? Look closely at one. Do you see hairs? What would it be like to travel through the soil? Would you need eyes or ears? What about the sense of touch and taste and smell? Give some examples of animals without eyes which live underground.

THE GREAT OUT-OF-DOORS

SECTION I: MOTHER EARTH

ACTIVITY 2: Decomposition

OBJECTIVE: Define decomposition, differentiate between organic and inorganic materials.

MATERIALS: Mesh, nylon and plastic bags, various inorganic and organic materials, scales

Three different kinds of bags -- mesh (onion bag), nylon (old stockings?) and plastic -- are used in this study. Fill the bags with organic debris such as lawn clippings, vegetable scraps, leaf litter from the ground. Include a few non-biodegradable (inorganic) items which are commonly thought of as trash or litter -- bottle tops or flip tops, glass, waste paper, styrofoam and plastic. These bags can either be buried in the ground or staked in a quiet area of a pond. In either case, some material from that community should be used in the bags. Decomposition will occur over a period of one to eight weeks. In order to make this process clearer, once a week remove the bags and describe the state of decomposition. Weigh the bags. Make sure the first weighing of the "pond bag" was wet. What are the differences which occur over time? Are there any differences in the rates of decomposition among the different types of containers? Based on what you know about the permeability of mesh, nylon and plastic, draw conclusions as to what conditions are necessary for decomposition.

What happened to the "trash" materials? Write a definition for the terms "organic" and "inorganic" using what you've just learned. Include as much information about the materials' composition as possible in each definition. How was it made? Was it ever alive? How quickly does it decompose in the natural environment? Is it reuseable?

Decomposing materials may look and smell icky. What is the value of the decomposition process? How are organic materials recycled? How should inorganic materials be recycled?

Discuss the impact of both organic and inorganic materials on the environment. How should each be properly disposed of? Don't forget -when the final weighing is completed, remove any remaining materials from the study sites.

THE GREAT OUT-OF-DOORS

SECTION I: MOTHER EARTH

ACTIVITY 3: Look at a fungus type

OBJECTIVE: Recognize the various fungi and mushrooms found in an area. Collect various samples of mushrooms and make spore prints.

MATERIALS: White and black paper, collection bags, glass jar

(This is an autumn activity). Take a fungus and mushroom walk after a rainstorm in a forested area. Look at the ground around trees, in moist areas, on rotten logs. Don't forget to look on the sides of trees. In your notebook, make a simple drawing of the mushroom or fungus shape. What colors are they? How big? How many different kinds have you seen? After the children have seen a number of different kinds, sit in a circle around a nice patch of fungi which will serve as good illustrations for discussion.

What do all the other plants in the forest have that a fungus does not? What do a tree and a daisy have in common that a fungus does not have? What color do all plants have that mushrooms don't have? Who knows the function of leaves? All plants need food. Green plants make their own food by using minerals in the soil and energy from the sun. Green plants make food for themselves in their leaves. Green chlorophyll in the leaves manufactures the plant's food. If fungi or mushrooms are not green, can they make their own food? Don't all plants need food to live? Where do mushrooms find food?

Fungi are part of the decomposition cycle. They obtain food from organisms which were once living. Why would a fungus live on a rotten log? Name some things found on the forest floor or in the soil from which fungi could obtain food. Fungi are one of the recyclers in the forest community. They decompose or break down dead materials into useable "pieces". These pieces are then used again by green plants to produce more food. Explain why a tree that dies and falls onto the forest floor will eventually disappear.

Have you ever seen a mushroom with a flower? Have you ever seen a mushroom seed? Fungi have neither flowers nor seeds. Very carefully pick a couple of mushrooms near the ground. Look under the cap. What do you see? The mushroom produces "dust" or spores. Spores are much like seeds but are microscopic. Carry the mushroom samples back to your classroom (but not in a plastic bag - the unventilated space will turn the mushroom into real mush). Take the cap off the stem and place half of the cap on a piece of white paper and the other half on black paper, spore side down. Cover the mushroom cap and paper with a glass jar to reduce air currents. If the mushroom has not already released its spores after a couple of days, the spores will make a distinctive print on the paper. What color are the spores? How does the spore print compare with the design of ridges or pores on the underside of the cap?

THE GREAT OUT-OF-DOORS

SECTION II: MICROHABITATS

ACTIVITY 1: The world under your feet

OBJECTIVE: Write or draw an original composition which illustrates an outdoor awareness experience. Construct a terrarium using materials collected on a nature walk.

MATERIALS: Crayons, pencils, paper, collection bags, wide-mouth jars

Lay out a square yard with stakes and string in a woodland. Assign three or four children to a hands and knees brigade to investigate within the boundaries. With your nose close to the ground, crawl around, slowly. Keep eyes, ears, nose and hands ready! How does the ground feel? Moist, cool, or dry? Has it rained recently? Can you smell anything? Can you see anything crawling around? What is it? Imagine that you were as small as a beetle. What would you see? Look at the plants. What shapes are they? Do any look like trees? These could be mosses. Others might be trees that have just sprouted.

Take some of the mosses and other plants back to the classroom in a plastic bag. Take enough soil to construct a terrarium in the classroom. Be sure to include some of the leaves, and small organisms to make a "microhabitat" of the forest community which you have been visiting. Can you find a toad? What do toads eat? How would you feed a toad if you took him out of the forest?

Now turn over, lie on your back and look up. Can you see the sun? Do you see any holes in the trees? What lives in holes? What happens to the leaves on the trees in the fall? Are you lying on any of them? What do you hear? Close your eyes and listen closely. What lives in the leaves of the tree?

This activity can be done in any biological community. Don't forget school playgrounds, sidewalks. There is a lot of wildlife in spaces that most people walk by.

Follow up this activity in the classroom by drawing pictures or composing a class poem written out by the instructor. What was it like to be small as a beetle? What did you smell, see? What is under a leaf? How far did you walk that day? What colors did you find?

THE GREAT OUT-OF-DOORS

SECTION II: MICROHABITATS

ACTIVITY 2: Life in a "log community"

OBJECTIVE: Investigate animals and plants found in a rotten log. Organize a list of organisms which are found.

MATERIALS: Pencil, paper, collection bags

What happens to a tree after it dies and falls to the ground? An entirely new community of life moves in to live on the log. Find a rotting log in a woodland and gather around to look at it. Look first at the outside. Mushrooms! They may come in many sizes, shapes and colors. Some look like shelves, parasols, or a turkey's tail. Puff balls or crusts of fungus also occur on the log. What is some of the other plant life? Green mosses look like pine trees and liverworts are flat. Seedlings of trees and other green plants start growing on a log. Do you see any root systems from these plants? What color are the roots?

Take apart a piece of the log. Look quickly as you pull off a piece of loose bark. Beetles, ants, millipedes and daddy-long-legs scurry away. Look at the newly exposed wood. Do you see any signs of travel - tunnels, holes? Twisting lines are made by the engraver beetle. What do you think the dwellers in this community eat? Plants get needed minerals from the wood. The small animals eat plants and each other!

Next, roll the log over. It is moist underneath, a good home for a salamander. You might find a mouse's nest with a store of seeds or a toad. There are smaller animals living underneath of the log too: more beetles, snails and slugs, earthworms, crickets and spiders. Look for an armored bug which rolls itself up into a ball. These are sowbugs or rollypollies.

When you have finished investigating the log community, be sure to roll the log back in place. During the activity, some of the smaller animals can be collected and taken back to the classroom in a jar. Place a piece of log in the jar for the animals to use as cover.

Draw pictures of the animals you saw and collected.

THE GREAT OUT-OF-DOORS

SECTION II: MICROHABITATS

ACTIVITY 3: Studying microhabitats

OBJECTIVE: Investigate various plants for signs of insect life. Collect various examples of plants which are used for insect homes. Compile a list of essential items needed for survival.

MATERIALS: Pencil, paper

Some insects' homes are so protective they create their own internal environment. Insects' galls can be found in almost any community. The oak apple gall is found in early summer on oak leaves. Pine cone-willow gall develops at the end of a willow twig. Goldenrod galls are round swellings on the stem; goldenrod species bloom during the summer in an open field. There are thousands of different types of galls; these are only a few of the more common ones. Collect as many different types as you can find. If the galls look old and dry, their formation is still of interest. Cut them open and investigate the inside. There will be a space in the middle. This space is or was occupied by an insect grub. The female adult insect (usually a wasp) injected an enzyme into the stem or leaf of the host plant, then she laid an egg. The enzyme caused the plant to change its growth process and form the swelling instead. How would this formation provide protection for the insect larvae? The larvae also find food within this gall. What would the larvae eat? If there isn't a grub inside the gall, look at the outside walls. Is there a small hole? This is a tunnel the grub made to the outside of the gall, to emerge as an adult insect.

Look for a white froth on the stems of field plants. Check to see what is inside. The insect you will find will be a spittle bug. What is the purpose of the froth this insect makes?

Leaf-rollers are another example of an insect which makes its home in a leaf. Did you find any leaves which were rolled over and "sewn" or stuck together? Give some examples of predators which would be dangerous to these insects. How do these predators hunt? Sight, sound, smell? How do these leaf homes protect these insects?

In the search for leaf homes, did you find any twisting lines in the leaf? The leaf miner tunnels between the upper and lower surface of the leaf, using the plant material as a food source.

In what ways do these shelters, galls, leaf tunnels actually become a microhabitat for these insects? What does their environment provide for them? Imagine yourself in a spaceship in outer space. Make a list of all the things you would need to take with you on your trip. Now, make a list of all the things which are provided for the insect grub in his gall home. Which things are the same, different?

THE GREAT OUT-OF-DOORS

SECTION II: MICROHABITATS

ACTIVITY 4: Let's Look at a tree

OBJECTIVE: Observe, discuss and distinguish between the various parts of a tree.

MATERIALS: Paper, pencil, crayons, tree boring

Walk to a nearby wood lot and choose a mature tree. Pick a large tree. First, look at the tree's leaves. Find a sample either on the tree or on the ground. What shape are they? Trace around the leaf on a sheet of paper to make it easier to remember what it looks like and press it in a book for identification.

Do a rubbing of the tree bark with crayon on your paper. How does the bark of your tree differ from other kinds of tree bark? Is it rough, with ridges or smooth and peeling off? What color is the bark? Why does a tree have bark? Compare bark with some part of your own body. How does your skin protect you? How does bark protect the tree? Do you see any insects crawling around on the tree trunk? Look down low, and above your head. What are they doing? Can insects hurt a tree? How can insects help a tree?

Next find a tree stump or sawed log and take a look at it. Find the heart or center of the tree, count the number of lines between the center and the outside bark. What does each line mean? How old is the tree? Find a tree stump which has been cut and has a smooth flat surface. With crayon and paper, do a rubbing of the tree rings. How old was this tree before it was cut down? Was the tree older than you are? Assume the tree was cut this year. Counting backwards from the bark, mark the tree ring which was made the year you were born. Mark other dates in recent history on the rubbing. Are there any irregularities or scars in the tree rings? These marks will show wounds from a fire or disease. What year was that scar made? Are all the rings equally spaced? The rings that are close together indicate the years where there was less water and the tree didn't grow very much. Mark on your rubbing the year and what you think might have happened at these irregularities. Back in the classroom, write a short story telling what you were doing and what the tree was doing in different years. Look at the grain in a board. Explain how the board was cut lengthwise and won't show growth rings. What do knot holes indicate? Different kinds of trees have different types of grain and color.

THE GREAT OUT-OF-DOORS

SECTION III: LIFE IN A POND

ACTIVITY 1: The Pond

OBJECTIVE: Collect organisms from a water community and draw examples of various components which make up a water community.

MATERIALS: Plastic bags, newspaper, construction paper, glue, dipnet, jars, crayons

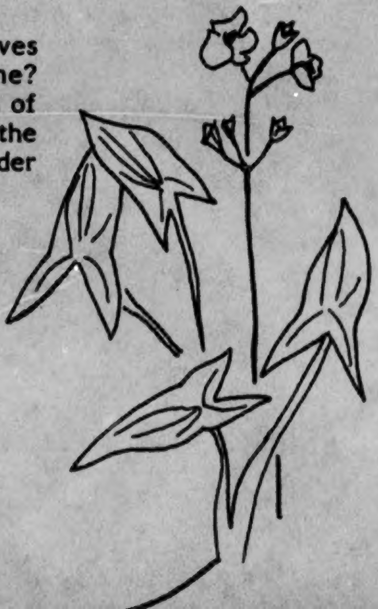
Take a trip to a nearby pond. Wear old clothes and gym shoes; this will get messy. First, look at the different plants surrounding the water and compare them to those in the water. How are they alike? How are they different? Collect four or five different kinds of leaves in a plastic bag and take them back to the classroom. Press the leaves between newspaper. Glue the dried leaves to construction paper to make a leaf collection.

Using a dipnet, let the children dip for small creatures in the pond. What did you find? Nothing? Look again - if it moves, it's a creature. Transfer it to a pan or jar to look at it more closely. Collect more of the pond inhabitants including insects, minnows, and tadpoles. Don't forget the bottom muck. What lives there?

Have you seen any dragonflies or "darning needles" flying above the pond? Look next in the pan full of "water bugs" for a large green or brown insect as shown in Illustration No. 8. This is what the dragon fly looks like before he/she is an adult. It is called a larvae. Pick it up - it won't bite. Look at its jaw. It looks like a shovel on a crane. The instructor should carefully extend its jaw. The dragonfly flips its jaw out to catch insects under water for a meal. Watch the larvae move. The dragonfly is jet-propelled. Instead of walking or swimming, the larvae merely shoots a stream of water from the rear which pushes him forward.

Bring the pond collection back to the classroom. A widemouth jar with pond water is suitable for insects. An aquarium with a bubbler is best for small fish and aquatic plants.

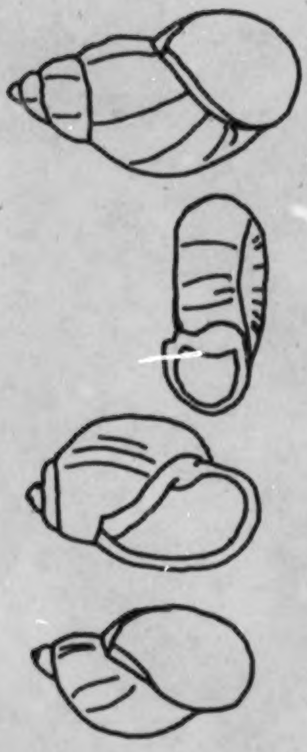
Take another look at the leaves collected at the pond. Are they all shaped the same? Are they all the same color green? Draw pictures of the leaves and of the insects and fish collected at the pond. Draw a picture of what you would see under water if you were a fish living in the pond.



LEGEND OF REPRESENTATIVE ANIMALS OF THE LITTORAL ZONE OF PONDS AND LAKES

(Illustrations on following page)

Series 1 to 4 are primarily herbivorous forms (primary consumers); series 5 to 8 are predators (secondary consumers). (1) pond snails; (2) small arthropods living on or near the bottom or associated with plants or detritus (left to right): a water mite; an amphipod; an isopod; (3) a pond caddis fly larva with its thin, light portable case; (4) (left to right) a mosquito larva; a clinging or periphytic mayfly nymph; a benthic mayfly nymph — note gill covers which protect gills from silt; (5) a predatory diving beetle, adult and (right) larva; (6) two predaceous Hemipterans, a water scorpion, and (right) a backswimmer; (7) a damsel fly nymph — note three caudal gills; (8) two dragonfly nymphs, a long-legged sprawling type (benthos), and (right) a slender climbing type (periphyton).



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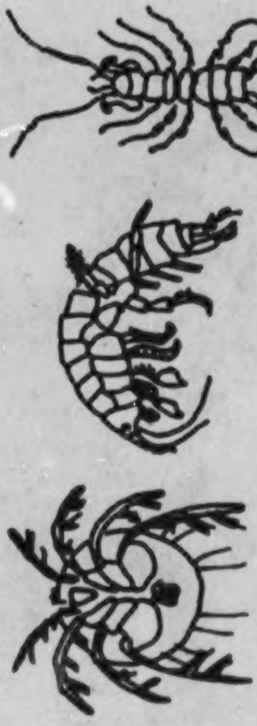

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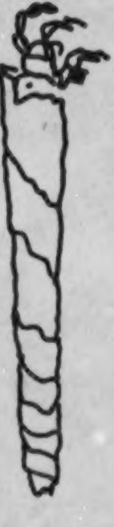

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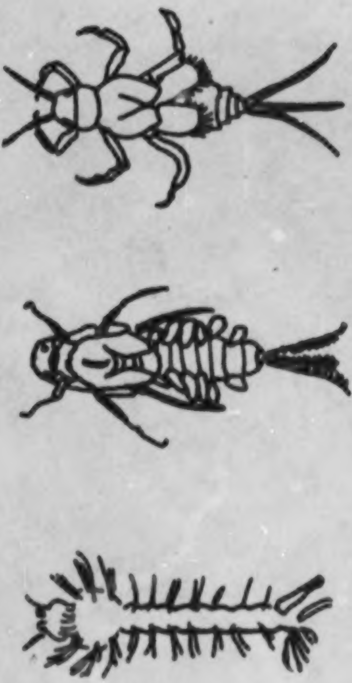

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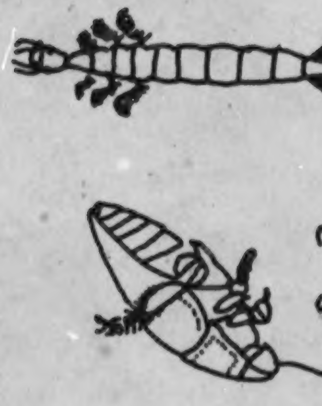

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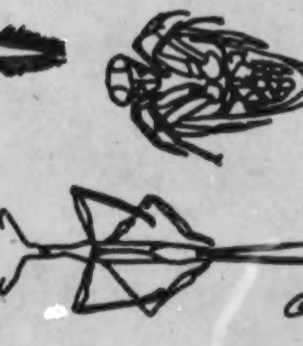

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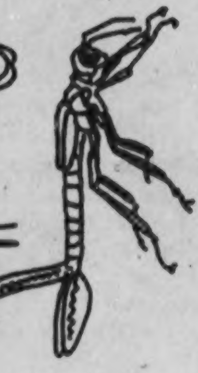

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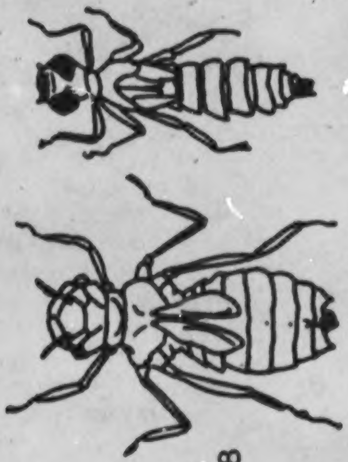


8

THE GREAT OUT-OF-DOORS

SECTION III: LIFE IN A POND

ACTIVITY 2: Water, water everywhere

OBJECTIVE: Observe and identify plants and animals that live in a pond community. Construct a food web of a pond community.

MATERIALS: Dipnets, collecting jars, plastic bags, field guides, pencil, paper

Equipped with old clothes, dipnets, collecting jars, plastic bags, and field guides, take a class excursion to a nearby pond. Sample the shoreline for emergent plants. Notice the depth of the water and the changes in plant adaptations. Arrow head is rooted to the bottom, leaves emerging from the water; seeds float. The water lily and water shield are rooted in a deeper area and their leaves float. In the deepest area of the pond, duckweed leaves float and are not rooted to the bottom at all. Using a dipnet, sample the animal inhabitants of the pond community. Using the picture key, identify the insects and other inhabitants. Along with extra pond water, take the pond collection back to the classroom and set up an aquarium. Which insects are the most numerous? Which insects are in the larval stage? What will the adult form look like? Did you see other animals which live in the pond, such as turtles, fish, water snakes, etc?

Wetlands are the most productive communities. Because of this productivity, inhabitants from other communities make use of the resources available in the pond. Look for signs of animal life around the pond. Footprints in the mud? Whose are they? Raccoons fish for crayfish and frogs along the shoreline. Deer come to the pond to drink.

Other animals leave footprints that you can't see. Amphibians such as the salamander come to the water to lay eggs. Ducks nest and feed in the pond community. Turtles leave the pond to lay their eggs on land. Turtle eggs in turn are eaten by larger animals from other communities. Above the pond, swallows feed on the abundance of insects which breed in the pond. Osprey and kingfishers are birds which hunt fish.

Make a list of the different kinds of animals found in and around the pond. How do they interact with each other? Draw a food web. What does a dragonfly eat? What does a frog eat? What eats a frog? Who hunts raccoons?

THE GREAT OUT-OF-DOORS

SECTION IV: ANIMAL BEHAVIOR

ACTIVITY 1: Night creatures

OBJECTIVE: Investigate the night behavior of various animals

MATERIALS: Old white sheet, flashlight, different colors of cellophane

On a warm windless evening, suspend on old white sheet near foliage and away from other light sources. Allow part of the sheet to lie on the ground to catch falling insects. Set up some lights so they shine on or through the sheet. What kinds of animals are attracted to the light? Describe some of the different kinds on the sheet. Are they brightly colored or plain? How many legs? Are they moths, beetles, flies?

How do the insects respond to a moving light? Use a flashlight as a brighter light source. Are the insects attracted to the brightest area? How do they behave as the bright spot moves. Try changing the color of the light. Cover the flashlight with different colors of cellophane. Which colors attract which insects?

Trace the path of an insect with a marking pen on the sheet. When there is not interference from other light sources, what does the path look like? What do you think is making the insect go where it's going?

Watch for any predators such as spiders or bats, which may come to take advantage of the insects attracted to the light. Identify the food chains.

This may be a good time to start or add to an insect collection. Being careful not to damage the insect, drop it into a kill jar to be mounted later. Some of the insects can be captured alive and kept in a well-ventilated jar for study in the daylight. Do these insects behave differently during the day?

THE GREAT OUT-OF-DOORS

SECTION IV: ANIMAL BEHAVIOR

ACTIVITY 2: Night life

OBJECTIVE: Determine how (or if) insect night life is affected by light and temperature

MATERIALS: Watch with second hand, thermometer, pencil, paper

Repeat the insect night life study proposed for Activity 1. The purpose of this study is to question the observations made about insect behavior. As well as visually observing behavior on the sheet, listen to the night sounds. On warm evenings, crickets, cicadas and katydids will be calling. Why do these insects "sing" at night? Is it because they're happy? Is it to entertain their nightly audience? No. These calls are a form of communication. The male insect is looking for a mate and making his position known to available females.

The environment also affects behavior. During warm weather, cricket and katydid chirps are rapid and high-pitched. As the temperature cools, the chirps slow. How does temperature affect insect metabolism (body functions)? How would metabolism affect the insect's call? Temperature affects the insects call so directly that temperature can be calculated by counting the number of chirps/minute and using the following formula (N=number chirps per minute):

Tree cricket: $\text{temperature} = 50 + \frac{N-90}{4.7}$

House cricket: $\text{temperature} = 50 + \frac{N-40}{4}$

Katydid: $\text{temperature} = 50 + \frac{N-19}{3}$

Check the temperature where the insect is calling, not from where you are listening.

THE GREAT OUT-OF-DOORS

SECTION V: MAPPING

ACTIVITY 1: Mapping

OBJECTIVE: Construct a simple map of an outdoor area

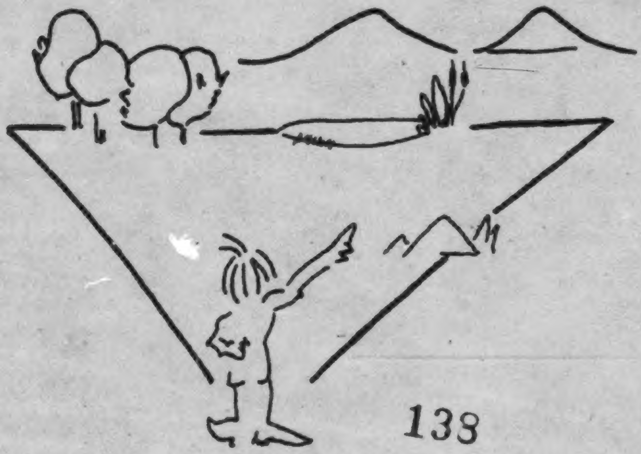
MATERIALS: Large sheets of paper, crayons, magic markers

Put a large sheet of paper (5' x 5', but the larger the better) on the floor or ground. One child stands in the middle and looks north. Locate the object nearest the child in his/her line of vision. Let him/her draw the object with magic markers or crayons on the paper at his/her feet. What is farthest away? Draw it at the edge of the paper. Fill in the remaining points. Another child should face a different direction (south) and repeat the activity. Continue this until all four directions have been mapped. If enough room is left, map the points between North, South, East and West lines of sight.

Use symbols to represent features or objects which are hard to draw. For example, blue for a pond, a hump for a hill. When the map is completed, take turns "reading" the map. Where are those trees that you see on the map in the east? If you wanted to go from a pond in the north to a field in the south, how would you get there? Trace your route on the map. If the distance is not too far between the points, have the children run the route traced on the map.

After finishing touches have been made, hang the map on a wall. Think about the areas you visited and mapped. Who lives in a pond? Cut out pictures or draw inhabitants. Don't forget who flies over a forest or who lives under the field. Have everyone think of the spot they would most like to be, and draw a self portrait on the map.

Put as much information on the map as you can think of. Name clumps of trees, a path, make a path if there isn't one there.



THE GREAT OUT-OF-DOORS

SECTION V: MAPPING

ACTIVITY 2: The Compass

OBJECTIVE: Mapping, using a compass

MATERIALS: Compass, small wooden stakes, tape measure, magic markers, large piece of white paper

The intention of mapping an area is to become more familiar with the landscape. This includes both large and small features. The size of the area to be mapped will vary according to the area and features to be studied. If the vegetation of an old field is being investigated, the study area can include the major features of the entire field, or only a square yard. What would be included on a map of a square yard? Develop a legend representing the different kinds of plants. Ant hills, holes, even the path of an insect can be included on the map. The entire class can study and map the locations of bird nests over an area. Or, the variety of tree types can be studied by three or four students. Stake out a square study plot using a compass. Mark the outside boundary with a stake. Use a compass to determine north. Walk directly north from the first stake, pacing out the dimensions of the study plot. Mark the second corner with a stake. Pace half-way back the north-south line. Then walk directly east, pacing out half the distance of the north-south line and mark with a stake. Next, walk directly west, pacing out the full dimensions and mark the last side with a stake. Begin making the map by marking major features that occur inside and along the study plot boundaries. These serve as reference points. Use features such as trees, large rocks, a grouping of shrubs, pond or stream. In the case of a smaller plot, use bare areas or particular plants.

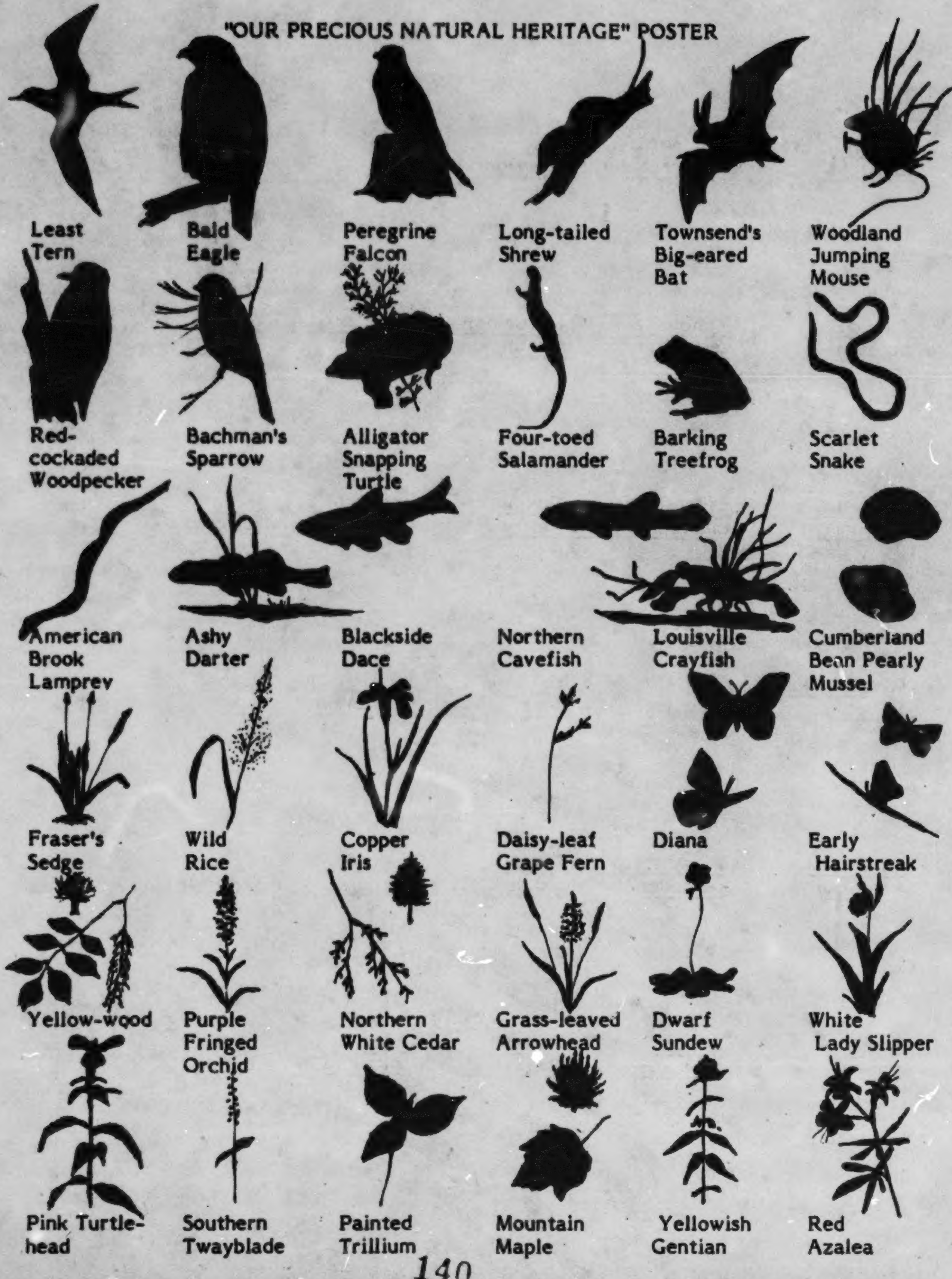
In the case of a small study plot, it may be possible to measure the distances between the points to be mapped. In a larger study plot, teams can be assigned to find the important points to be placed on the map. Estimate or pace out the distances between the reference points in order to place the points of interest on the map as accurately as possible.

Develop a legend such as a green dot for a tree, yellow for tall grasses, red for a blooming flower, blue for water. Make notes on the map. For example, if the class is studying bird nests, it may be important to include where the nest was located. Was it on the ground in a tree? In what kind of tree? Can you tell which bird made the nest?

Hang the map or maps on the wall. What are the most colors on the map? What animals would you expect to see in the community that was mapped? How do you think the area looked fifty years ago? How would you expect it to look in the future?

APPENDIX A

"OUR PRECIOUS NATURAL HERITAGE" POSTER


Least Tern
Bald Eagle
Peregrine Falcon
Long-tailed Shrew
Townsend's Big-eared Bat
Woodland Jumping Mouse
Red-cockaded Woodpecker
Bachman's Sparrow
Alligator Snapping Turtle
Four-toed Salamander
Barking Treefrog
Scarlet Snake
American Brook Lamprey
Ashy Darter
Blackside Dace
Northern Cavefish
Louisville Crayfish
Cumberland Bean Pearly Mussel
Fraser's Sedge
Wild Rice
Copper Iris
Daisy-leaf Grape Fern
Diana
Early Hairstreak
Yellow-wood
Purple Fringed Orchid
Northern White Cedar
Grass-leaved Arrowhead
Dwarf Sundew
White Lady Slipper
Pink Turtlehead
Southern Twayblade
Painted Trillium
Mountain Maple
Yellowish Gentian
Red Azalea

SCIENTIFIC NAMES FOR "OUR PRECIOUS NATURAL HERITAGE" POSTER

Sterna albifrons
Haliaeetus leucocephalus
Falco peregrinus
Sorex dispar
Plecotus townsendii
Napaeozapus insignis

Picoides borealis
Aimophila aestivalis
Macroclemys temmincki
Hemidactylium scutatum
Hyla gratiosa
Cemophora coccinea

Lampetra appendix
Etheostoma cinereum
Phoxinus cumberlandensis
Amblyopsis spelaea
Orconectes jeffersoni
Villosa trabalis

Cymophyllus fraseri
Zizania aquatica
Iris fulva
Botrychium matricariifolium
Speyeria diana
Erora laeta

Cladrastis kentukea
Platanthera psycodes
Thuja occidentalis
Sagittaria graminea
Drosera brevifolia
Cypripedium candidum

Chelone obliqua
Listera australis
Trillium undulatum
Acer spicatum
Gentiana alba
Rhododendron bakeri

APPENDIX B

PRESERVING KENTUCKY'S NATURAL HERITAGE

> We abuse land because we regard it as a commodity belonging to us.
> When we see land as a community to which we belong,
> We may begin to use it with love and respect.
>
> Aldo Leopold, 1948

INTRODUCTION

The Kentucky Nature Preserves Commission, established by an act of the legislature in 1976, has embarked upon a program aimed at protecting our natural heritage by establishing a system of nature preserves. A detailed and sophisticated information system has been developed to aid in the identification and protection of important natural areas. The Natural Heritage Program, conceived and developed by The Nature Conservancy, is currently employed by Kentucky as a method of collecting, managing, and analyzing natural history data. The heritage data provides information upon which the Commission bases logical decisions concerning conservation and/or preservation.

This data is also useful to developers and decision-makers who recognize the importance of taking Kentucky's natural heritage into consideration. Informed planning can now enter into the decision-making processes, and unnecessary destruction of valuable and unique natural resources can be avoided.

The best decisions concerning the most effective use of Kentucky's natural resources can be made only after considering the greatest quantity of reliable information. This section is designed to introduce the Kentucky Natural Heritage data base and to emphasize its role as an integral part in planning Kentucky's future.

KENTUCKY NATURAL HERITAGE PROGRAM

Inventory Process

The natural features, identified and inventoried as Elements of Natural Diversity, include those considered threatened with extirpation from the state and those that formed a significant part of Kentucky's recent natural history. The phrase "elements of natural diversity" refers to the full array of earth's features created or formed by nature's biological and physical processes. This includes such entities as biological species, biological communities, recognizable ecosystems, geological structures, caves or any type of natural feature which is part of the diversity of nature found in Kentucky. The elements of natural diversity are grouped as follows:

Element Group	Example
1. Special plant species	White lady slipper (*Cypripedium candidum*)
2. Special animal species	Indiana bat (*Myotis sodalis*)
3. Plant communities	Bottomland hardwood forest
4. Aquatic communities	Oxbow lakes
5. Geological features	Natural bridges
6. Natural history elements	Genetic specialties

Lists of the various elements were prepared and represent a synthesis of information gathered from a variety of local, regional, state, and federal sources. Included are data from pertinent literature, state and federal species lists, museum and herbarium records, recommendations from professional scientists, and results from field surveys.

Animal and plant species listed are 1) those recognized or proposed as federally threatened or endangered, 2) those which may have recently been extirpated from Kentucky, 3) those whose populations and/or distribution are decreasing to dangerously low levels, 4) those whose occurrences in Kentucky represent distributional limits, and 5) those which in the opinion of experts warrant special consideration.

Plant and aquatic communities, geologic features and natural history elements that contribute significantly to Kentucky's natural history are also inventoried. The constant input of data on Kentucky's natural diversity insures that the dynamic element lists reflect the status of our natural heritage.

By identifying and mapping the most vulnerable of our state's elements, we can determine which areas harbor the most critical and/or rarest components of our natural diversity. These areas, once located, will be those most sought after in our preservation efforts. In order to more accurately ascertain the protective status of the elements, all managed areas (state parks, wild rivers, etc.) are included as part of the heritage maps.

Depending upon the status and number of elements and the amount and level of existing protection afforded to that area or element, decisions will then be made as to the course of action required. This may involve negotiations for dedication of some or all of the area as a Nature Preserve (the greatest amount of legal protection land can receive in Kentucky) or may simply require notification of the land owner or manager that a rare element has been found on his/her property and that protection and preservation of the element(s) is highly recommended.

Accessing the Kentucky Natural Heritage Data Base

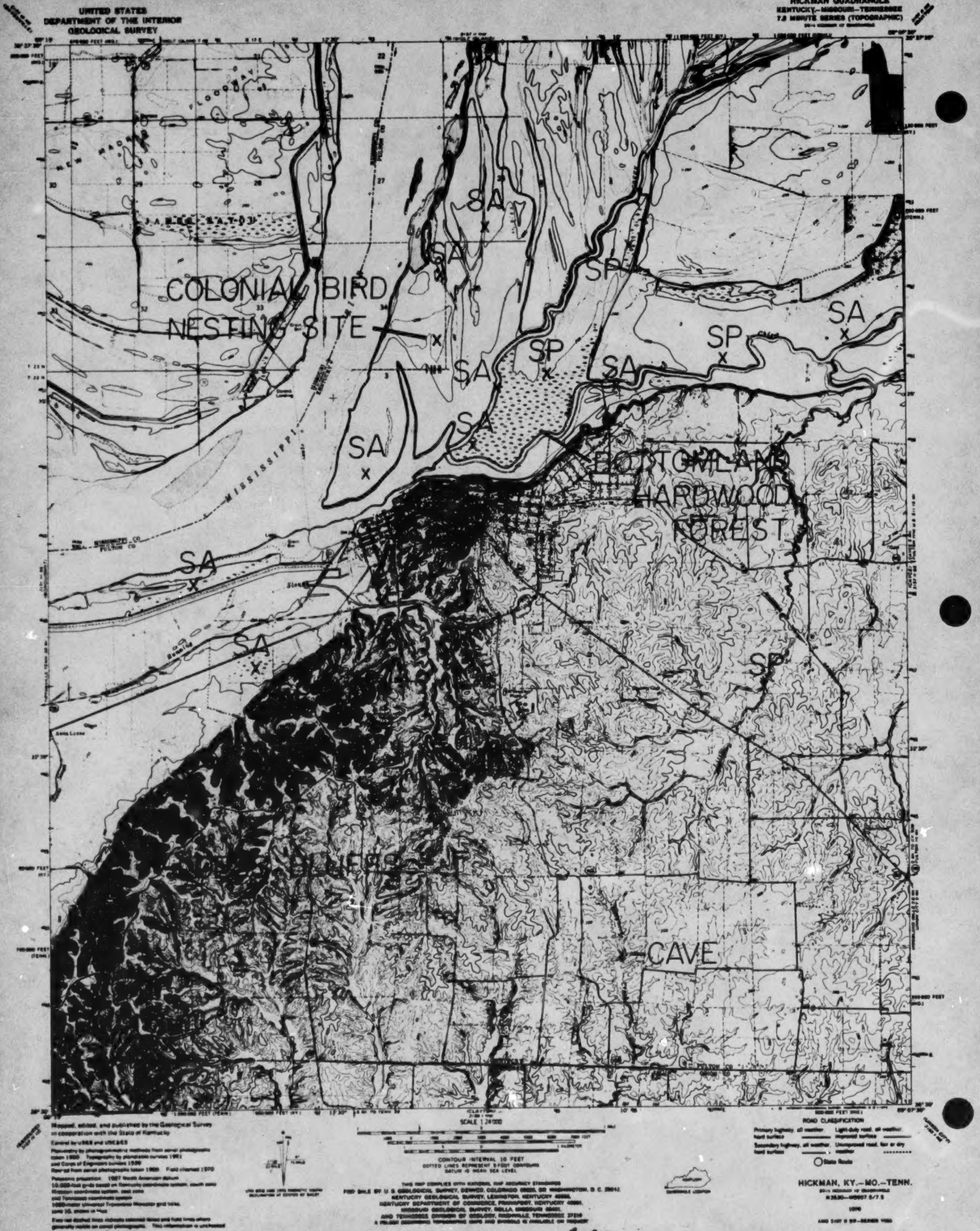
In analyzing the potential impact of a specific project, it is important to know which elements, if any, occur in the project area and the status of each. As a planning tool, the natural heritage data base can not only be used to indicate the location of fragile natural areas and elements of natural diversity, but can lead to the exploration of alternative methods and procedures which minimize or eliminate the threat of destruction to such areas or elements.

Data management utilizes both manual and computer-assisted systems. Location of element occurrences are plotted on 7.5 minute U. S. Geological Survey topographic maps. Manual files include the number and location of each mapped occurrence. Specific information about each element (type, location, data source, description, protection status, etc.) is entered into a computer. Thus, as data accumulates, grouping or aggregation of element occurrences may indicate important areas which harbor the rarest components of our natural diversity. An example of mapped occurrences is shown in Figure 1 (SA=Special Animal, SP=Special Plant). The versatility of the data management system is further enhanced by computer programs designed to locate, for example, statewide occurrences of one element or all elements within a specified area. Those directly involved with public or private land-use decisions (government agencies, land developers, environmental consultants, etc.) may request information from the data base by specifying 1) the type of data required, 2) the geographic area of interest, and 3) the intended application of the data.

One of the most important resources of the Commission is a highly professional staff capable of sophisticated analysis and interpretation of the data base. A number of requests for environmental review utilizing the Heritage information have been received and processed by the Nature Preserves Commission.

CONCLUSION

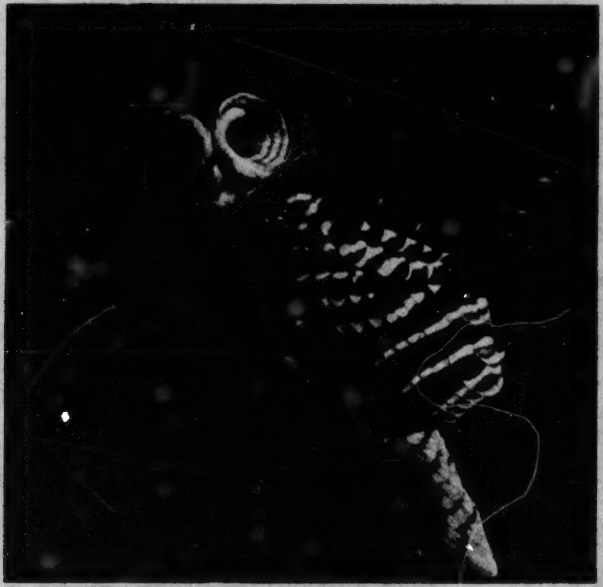
Few actions, if any, approach the noble and worthy deed of one generation passing to the next a heritage of unspoiled natural beauty. This naturally beautiful Kentucky, which we hold in trust for our children, is rapidly and systematically being threatened, altered, or destroyed by human activity. Areas which still retain some or all of their original qualities exist today only as scattered remnants of a once magnificent natural environment. The continued existence and protection of those natural areas requires the development of a responsible land ethic by all citizens of the Commonwealth.


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
HICKMAN QUADRANGLE
KENTUCKY–MISSOURI–TENNESSEE
7.5 MINUTE SERIES (TOPOGRAPHIC)
SA
SA
COLONIAL BIRD
NESTING SITE
SP
SP
SP
SA
SA
SA
SA
SA
SA
SA
BOTTOMLAND
HARDWOOD
FOREST
MISSISSIPPI
SP
BLUFFS
CAVE
SCALE 1:24000
CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL
ROAD CLASSIFICATION
HICKMAN, KY.–MO.–TENN.
1970

APPENDIX C

BE WILDLIFE WISE!

PLEASE SHARE YOUR KENTUCKY TAX REFUND WITH WILDLIFE


Courtesy of Ray Harm and Frame House Gallery
©Copyright Frame House Gallery 1980 World Rights Reserved

We Kentuckians now have a new voluntary opportunity to help preserve and protect our rich natural heritage.

On line 20 of the 1980 Kentucky income tax form, citizens can make a tax deductible contribution by designating all or a portion of their TAX REFUND to support non-game wildlife programs and to purchase and maintain natural areas. These programs are sponsored by the Department of Fish and Wildlife Resources and the Kentucky Nature Preserves Commission.

Kentucky is the first state in the East to initiate this program whereby citizens can assist in the preservation of their natural heritage. The State of Colorado began this program three years ago. Over $300,000 was raised the first year, over $500,000 the second year, and over $600,000 this year.

The Kentucky Nature Preserves Commission was established by the 1976 General Assembly to conduct a statewide inventory of natural areas, and to develop a nature preserves system. These dedicated nature preserves will insure that the full array of Kentucky's natural diversity will be protected for present and future generations to enjoy. All citizens are encouraged to participate in this new opportunity to protect our precious natural heritage. With your help, we can save the best of Kentucky's remaining natural areas.

If you would like more information, please contact:

Donald F. Harker, Jr., Director
Kentucky Nature Preserves Commission
407 Broadway
Frankfort, Kentucky 40601
(502) 564-2886

Thank you for your interest in Kentucky's natural heritage.

APPENDIX D

ENVIRONMENTAL EDUCATION RESOURCE CENTERS

(Some of these have resident programs where teachers and students can visit)

Buckley Wildlife Sanctuary
Rural Route 3
Frankfort, Kentucky 40601
Contact: Tim Williams (606) 873-5711

This sanctuary, located in the Bluegrass region, offers slide shows, lectures and environmental studies, both at the sanctuary and in schools. Much is done to maintain the existing habitats and to teach their values to the visitors. They also have a number of surveys on file on the flora and fauna of the area.

Center for Environmental Education
Murray State University
Murray, Kentucky 42071
Contact: Terry Wilson (502) 762-2747

The Center offers undergraduate teacher courses and a master's degree program in environmental education. In addition, many classroom materials are housed and can be checked out by teachers. The Center coordinates environmental education activities in the western Kentucky consortium, which is made up of 13 school districts. Graduate internships are available throughout the year.

Eastern Kentucky University
Division of Natural Areas
Maywoods Environmental and Educational Laboratory
Richmond, Kentucky 40475
Contact: Dr. Bill Martin (606) 622-3122

The Maywoods Laboratory was established as an outdoor facility for instruction in environmental and natural resource education for all ages, as well as an area for long-term environmental monitoring and ecological research. They have a number of study areas including an oak forest, thirteen acre lake, and old fields.

Innovative Diversion Project
4409 Preston Highway, Durrett Annex
Louisville, Kentucky 40213
Contact: David Wicks (502) 367-6044

Project I.D. is a wilderness-based adventure program established by the Jefferson County Board of Education to provide alternative education to troubled youth. It places students in an invigorating and challenging environment that offers a series of progressively demanding experiences. It offers curriculum guidelines for outdoor education, camping supplies, slide show presentations, a resource center and training sessions to interested groups.

Jefferson County Environmental Policy Office
208 South 5th Street, Room 400
Louisville, Kentucky 40202
Contact: Noel Rueff (502) 581-3764

This is a local government office which offers lectures, classroom materials, slide presentations and pamphlets to inform and educate the public concerning energy and the environment so they can make sound policy decisions in these areas.

Louisville Zoo
1100 Trevillian Way
Louisville, Kentucky 40213
Contact: David Jenkins - Education Curator
(502) 459-2181

The Louisville Zoo has tours for school groups. In addition, teacher packets are available.

Mammoth Cave National Park
Mammoth Cave
Kentucky 42259
Contact: Sharon Ganci (502) 758-1211

The park offers a number of educational and recreational activities which include slide programs, cave tours, nature walks, environmental education activities, camping and boating.

McCreary County 4-H/Environmental Education
Cooperative Extension Service
McCreary County Courthouse
Whitley City, Kentucky 42653
Contact: Steve Ibershoff (606) 376-2524

The McCreary County 4-H can provide lectures, materials for classrooms, slide presentations, and publications of the Extension Service Information.

Morehead State University - Center For Environmental Studies
U.P.O. Box 780
Morehead, Kentucky 40351
Contact: Dr. Jerry DeMoss or Dr. Jerry Howell (606) 783-3328

This center offers a major and minor in environmental studies to prepare students for field careers. It also provide lectures, materials and awards for all levels of education in Eastern Kentucky.

Otter Creek Park
Route 1, Otter Creek Park
Vine Grove, Kentucky 40175
Contact: Pattie Smith (502) 583-3577

Otter Creek Park can provide interpretive hikes which are sensory and participatory. They also have some classroom activity sheets. In addition there is a nature center and camping facilities available for school groups.

APPENDIX D (continued)

Owensboro Area Museum
2829 South Griffith Avenue
Owensboro, Kentucky 42301
Contact: Joe Ford (502) 683-0296 or (502) 683-0297

This museum is a natural history and historical museum developing in students an interest in the natural world and the history of our progress. They act to preserve historic sites as well as biological materials that are endangered locally. The museum offers a number of educational services, runs a planetarium, and two libraries.

Pine Mountain Settlement School
Pine Mountian
Kentucky 40810
Contact: David Siegenthaler (606) 558-4481

Pine Mountain works to heighten environmental awareness by offering to its students an opportunity to learn about the earth and understand how the life systems function. They offer a number of services to help people feel at ease in the natural environment, such as teacher in-service, and worskhops. They have access to strip and deed mines, virgin forests, and Appalachian culture.

Rockcastle Resource Center
Post Office Box 298
Livingston, Kentucky 40455
Contact: David Siegenthaler (606) 453-2315

Through the use of lectures, also demonstration centers, and a technical network of experts working directly with the people, this program seeks to make science and technology responsive to the needs of the Appalachian people and to enhance citizen participation with, and control of, their natural resources.

Tennessee Valley Authority
Land Between the Lake
Golden Pond, Kentucky 42231
Contact: M. Janet Caldmeyer (502) 924-5602

Numerous interpretive facilities are available to schools and to the public at LBL. Two resident facilities with dining hall are open year-round to schools and to other groups. There are various natural and manmade areas for the class study including a historic farmplace, a working farm, water and forest studies, a new energy display and several thousand acres to explore.

Urban Homestead House
818 East Chestnut Street
Louisville, Kentucky 40204
Contact: Phyliss Fitzgerald (502) 587-3028

Practical workshops in appropriate technology, such as solar panel construction, solar greenhouses, energizing homes and gardening are offered here to educate the public about alternative lifestyles.

State Agencies

Kentucky Nature Preserves Commission
407 Broadway
Frankfort, Kentucky 40601

The Commission conducts statewide surveys to seek areas which can become part of a nature preserves system. These areas will be protected for present and future generations to study and enjoy. They encourage the use of these preserves for environmental education and offer teacher workshops. Publications include: Ferns and Fern Allies of Kentucky and Kentucky Natural Areas Plan.

Kentucky Department of Education
Environmental - Energy Education
Room 1829 Capital Plaza Tower
Frankfort, Kentucky 40601

This office can provide lectures and in-service training in environmental and energy education. The Project Learning Tree Program is also available. Publications available upon request include: KAEER Fair Resource Guide 1979 and 1980, Energy Conservation Activities for the Clasroom, K-12, A Teacher's Guide to Energy Resources in Kentucky, Building Outdoor Classrooms, and Bringing the Great Outdoors to Your Classroom.

Environmental Quality Commission
332 State National Bank Building
Frankfort, Kentucky 40601

The EQC functions in an advisory capacity to the Kentucky Department for Natural Resources and Environmental Protection and the Governor on all rules, regulations, policies, plans and procedures for the Department. Publications include: Blackbird Study, and Controlling Hazardous Materials in Kentucky. In addition, an annual report is published.

Kentucky Division of Water
Ft. Boone Plaza, Wilkerson Blvd.
Frankfort, Kentucky 40601

To insure clean water for all uses, the Division works throughout the state to abate pollution and provide adequate water supplies. They are available for lectures and slide shows and can provide films and handouts on water quality.

Kentucky Geological Survey
University of Kentucky
311 Breckinridge Hall
Lexington, Kentucky 40506

This research and service department has topographical maps available of Kentucky counties as well as geological quadrangle maps, bedrock topography maps, flood maps, mineral and water reports and an assortment of various data on Kentucky's geologic structure. A list of publications is available upon request.

Kentucky Department of Fish and Wildlife Resources
Game Farm, Louisville Road
Frankfort, Kentucky 40601

This department offers conservation programs to all fifth and sixth graders in Kentucky. Hunter safety certification courses are conducted for groups of twenty or more for ages ten years and up. Information is available on the formation of Junior Sportsman Clubs for seventh, eighth and ninth graders. Publications include: Happy Hunting Ground, brochures.

Kentucky Division of Conservation
1121 Louisville Road
Frankfort, Kentucky 40601

This department provides lectures, conservation films, slide programs and demonstrations of geologic and geographic processes such as soil surveys, soil interpretation, and sedimentation and erosion. They promote and support the wise use of natural resources.

Kentucky Division of Forestry
618 Teton Trail
Frankfort, Kentucky 40601

In developing an awareness of the importance of Kentucky's forests, this department offers classroom materials, films, field trips and workshops which address forest conservation and environmental education. A list of publications is available upon request.

Kentucky Department of Energy
Post Office Box 11808
Iron Works Pike
Lexington, Kentucky 40578

This department is responsible for development and implementation of major energy conservation programs involving all sectors of the Kentucky economy including broad public educational efforts. They offer a wide variety of material on conservation and provide seminars, workshops and public awareness activities.

APPENDIX E

ENVIRONMENTAL LEARNING CENTER

An environmental center for the classroom is an exciting addition - it gives students opportunities to explore and examine on their own or in small groups. Use your environmental learning center as a collection table to hold all those rocks and sticks and insects and artifacts the students bring in. Share pictures, poems, reference books, drawings with your students. Keep it messy and interesting and full of new ideas. The following are ideas to help get it started!

ENVIRONMENTAL AND ENERGY LEARNING CENTER

Possible Learning Objectives:

1. Identifying the components of the environment and the ecological cycles.
2. Learning facts concerning the needs and care of plants and animals.
3. Becoming familiar with books, periodicals, organizations, and magazines on wildlife, energy, environmental crisis, etc.
4. Drawing conclusions on ways to benefit and improve environmental conditions.
5. Think creatively by writing poems, stories, and plays on society's need for environmental improvements.
6. Matching flora and fauna to its particular habitat.
7. Naming at least four (4) new ways to conserve energy at home and practicing at least four (4) new ways to conserve energy at home.
8. Recognizing new words about the environment and energy.
9. Creating positive attitudes toward self and respect for one's surroundings.
10. Naming four (4) animals and/or plants endangered in Kentucky.
11. Listing three (3) ways to invite wildlife to visit school grounds or backyard at home.
12. Practicing at least three (3) new ways in which to encourage wildlife on school grounds or backyard.

APPENDIX E (continued)

13. Becoming familiar with ways in which one is part of the ecology cycle.

14. Becoming familiar with way to recycle man-made products and practice one way to recycle a man-made product.

Possible Activities at the Learning Centers:

1. Compose stories, poems, and artwork about the environment for a classroom ecology notebook.

2. Make a collection from magazine cut-out of various animals to classify, identify, or use as inspiration for creative writing or artwork.

3. Establish a shelf of items collected on nature walks for students to identify and explore. Change items from mouth to mouth or season to season. Hold class discussion on how these items fit into the ecology cycle.

4. Establish a bird feeding station outside your classroom window to observe behavior, feeding habits appreciation, identification and importance of birds in the ecology cycle.

5. Participate in a paper recycling program in class.

6 Contribute cans to the can recycling program in class.

7. Identify plants collected on nature walks. (Do not pick endangered plants and only pick plants which are common.)

8. Work puzzles on environmental topics.

9. Construct a terrarium to illustrate various cycles.

10. Read current newspaper articles on environmental topics for class discussion.

11. Grow plants from household vegetables such as carrots, beets, avocado seeds, pineapple tops and sweet potatoes.

12. Look at books, magazines, and flimstrips on environmental issues.

13. Construct display charts on ways to conserve energy.

14. Construct display charts on endangered animals, ecology cycle, types of energy, etc.

15. Do activities listed on the environmental/energy task cards.

16. Plant and care for seeds collected on nature walks.

17. Read and complete activities in the environmental learning package.

18. Write conservation organizations for information on their purpose and accomplishments in the environmental field. (See list of Environmental Resource Centers in Appendix D).

19. Record and chart information on seed and plant requirements for growth.

20. Plan to develop a classroom garden plot for the class on school grounds. Start seeds in window gardens. Contact your local county extension agent and local 4-H club for information and help.

21. Classify and collect rocks taken from field trips, nature walks, etc.

ACTIVITIES ARE LIMITLESS!!

Examples of some things to collect from nature walks:

BUGS, SEEDS, SCATS, ROCKS, BONES, GALLS, LEAVES, FOSSILS, WEEDS TO IDENTIFY AND DRY FOR FLOWER ARRANGEMENTS, EMPTY HIVES AND DESERTED NESTS, SHELLS, FUNGI, FEATHERS, SMALL SECTIONS OF FALLEN TREES AND LIMBS TO STUDY.

A List Of Possible Resources And Equipment For The Learning Center.

1. Magazines, newspapers, library books, periodicals, library filmstrips and projector.

2. Posters (student or commercial) on ways to conserve energy.

3. Collection of various puzzles and games on the environment, energy, etc.

4. Construction paper, glue, string, crayons, markers, pencils, scissors, etc.

5. Task cards on the environment, energy, etc.

6. Materials to make terrariums and/or aquariums.

7. Materials for a bird feeding station.

8. Large, lined box to hold aluminum cans.

9. Pots, digging tools, soil, jars, cans, etc.

APPENDIX E (continued)

10. Area set aside to hold nature mystery items, rocks, etc.

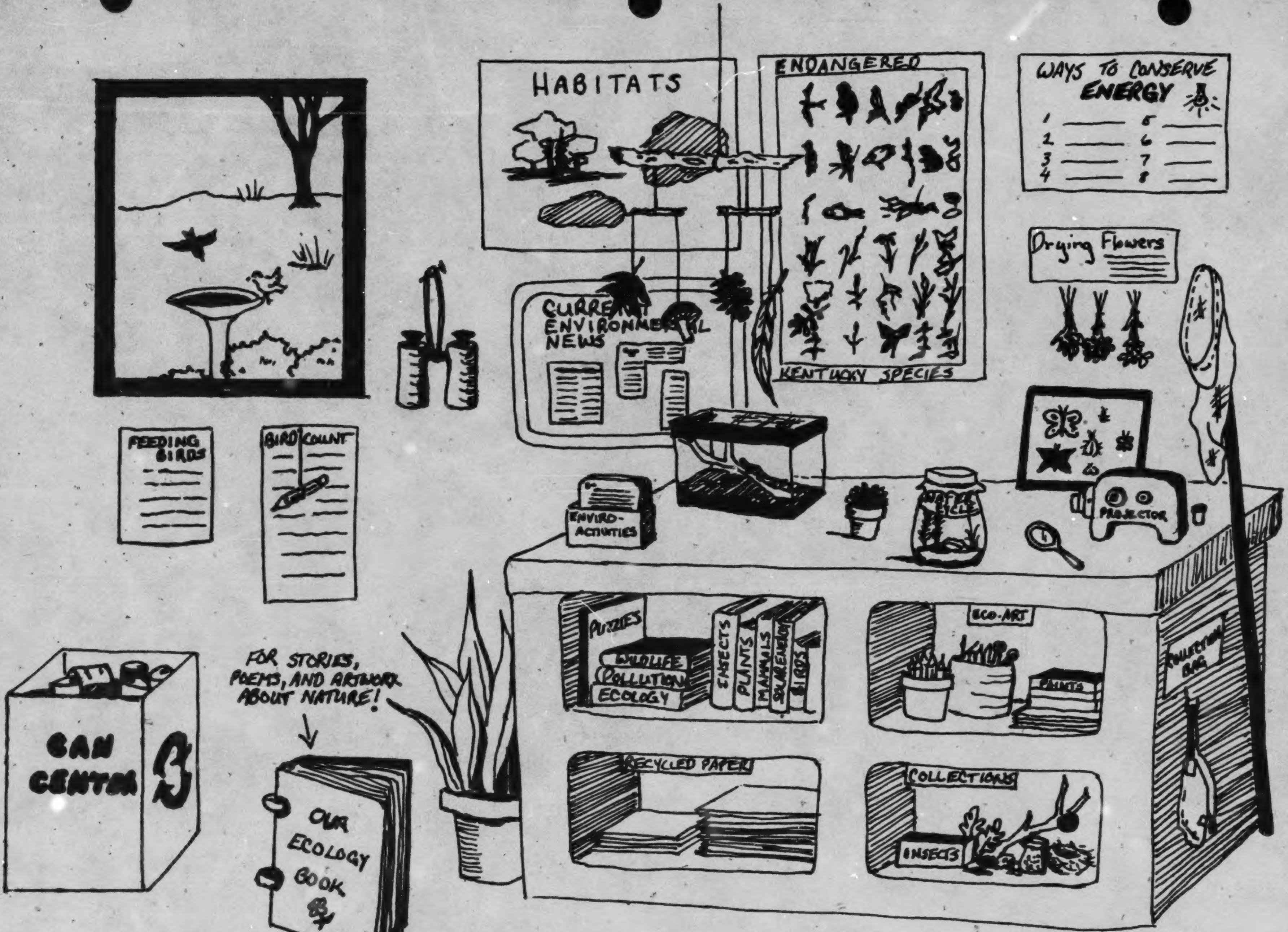
11. Large chart on endangered Kentucky animals.

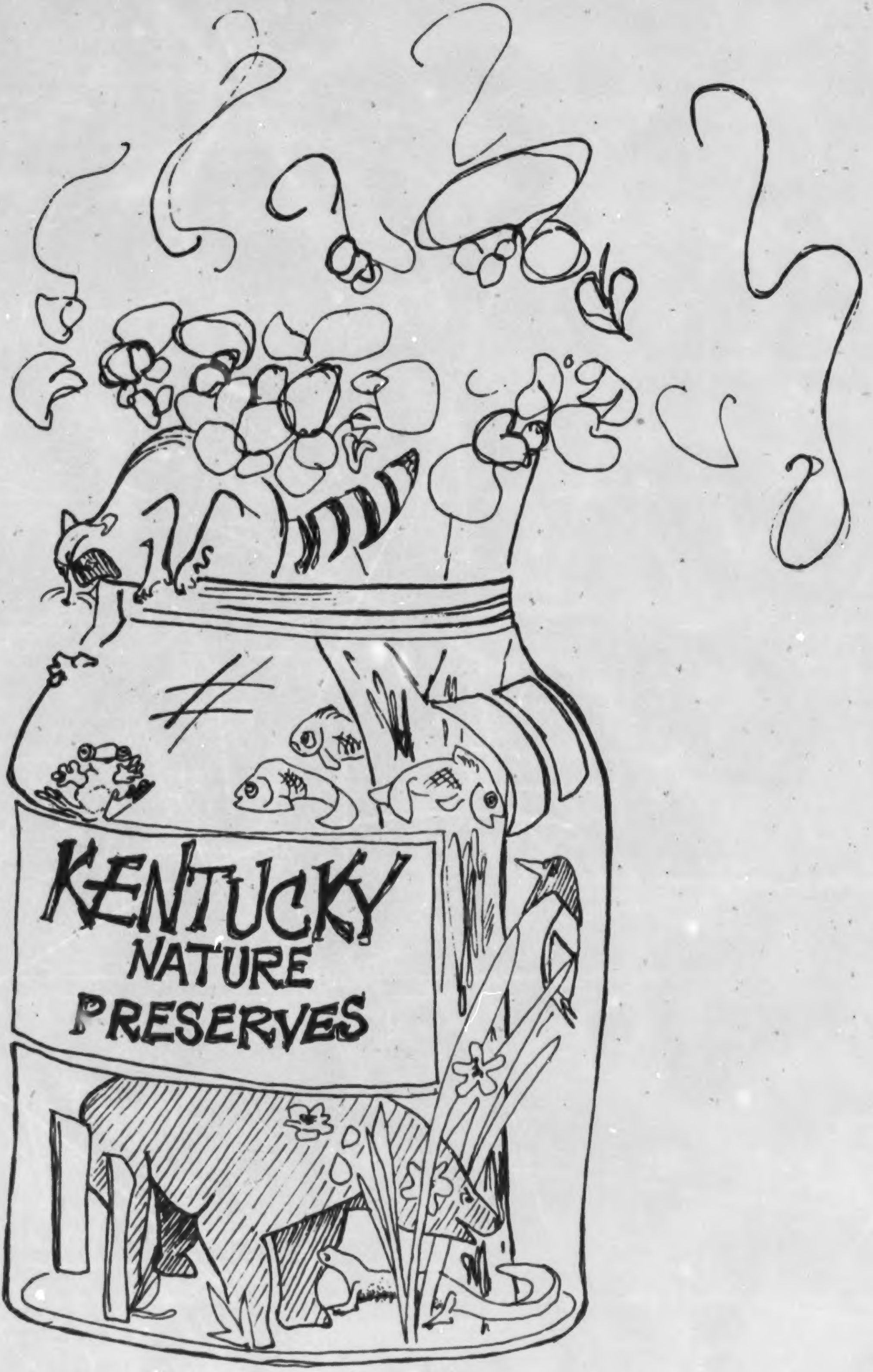
12. Large chart on conservation organizations.

13. Small bulletin board or area on wall to hold newspaper articles.

14. Be Wildlife Wise Poster

15. Large table with drawer, if possible. If no drawers are available, then construct shelves from board and bricks, stack boxes, or tack ice cream cartons together.


HABITATS
ENDANGERED
KENTUCKY SPECIES
WAYS TO CONSERVE ENERGY
1
2
3
4
5
6
7
8
Drying Flowers
CURRENT ENVIRONMENTAL NEWS
FEEDING BIRDS
BIRD COUNT
ENVIRO-ACTIVITIES
WATER CYCLE
PROJECTOR
PUZZLES
WILDLIFE
POLLUTION
ECOLOGY
INSECTS
PLANTS
MAMMALS
SOLAR ENERGY
BIRDS
ECO-ART
PAINTS
COLLECTION BAG
RECYCLED PAPER
COLLECTIONS
INSECTS
CAN CENTER
FOR STORIES, POEMS, AND ARTWORK ABOUT NATURE!
OUR ECOLOGY BOOK



KENTUCKY
NATURE
PRESERVES

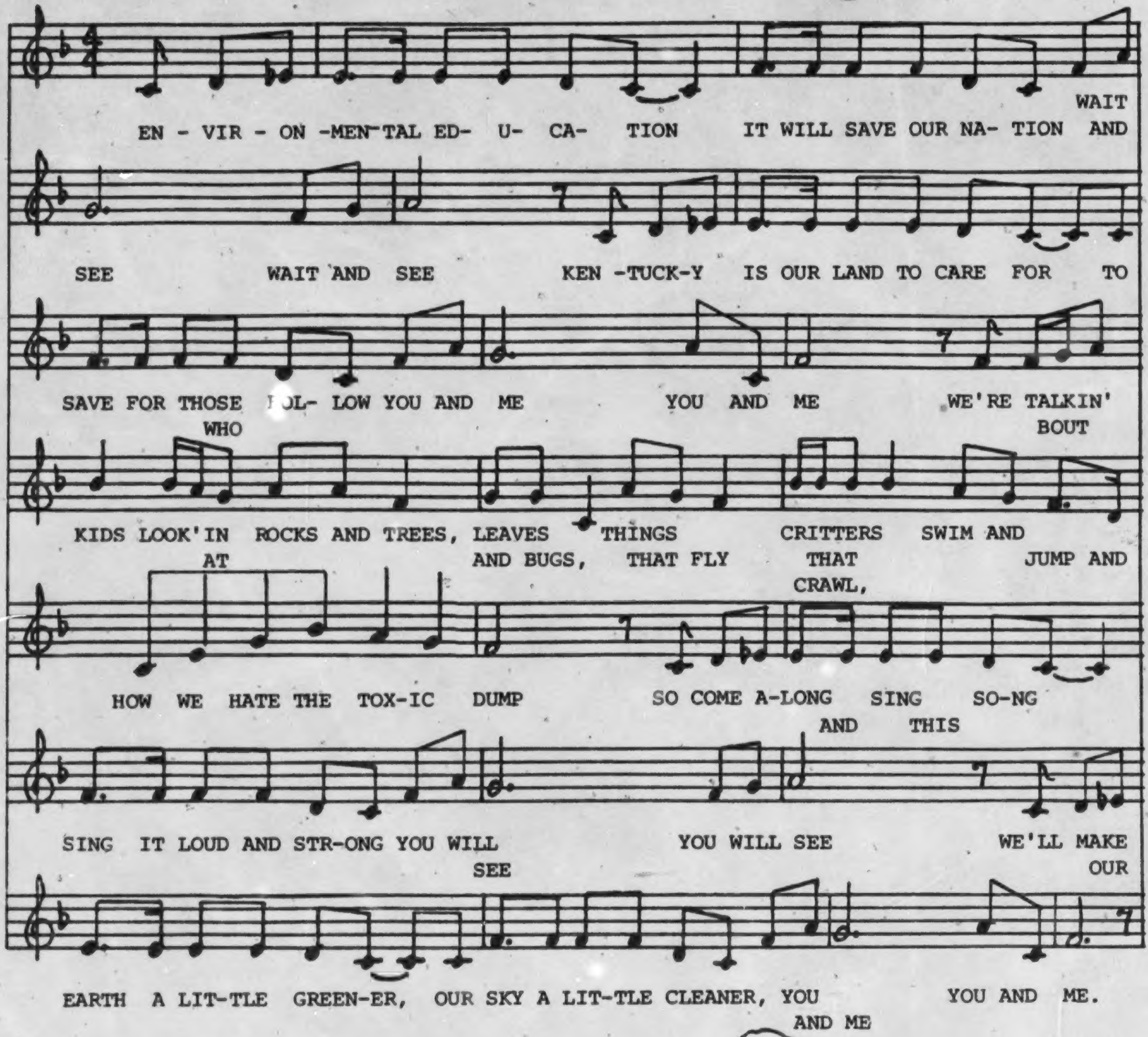
Our Natural Heritage

A Handbook For Teachers

WORKSHEETS

WORDS AND MUSIC
BY:
Donald F. Harker
& Van F. Denton

ENVIRONMENTAL EDUCATION


EN - VIR - ON -MEN-TAL ED- U- CA- TION IT WILL SAVE OUR NA- TION AND WAIT
SEE WAIT AND SEE KEN -TUCK-Y IS OUR LAND TO CARE FOR TO
SAVE FOR THOSE WHO FOL- LOW YOU AND ME YOU AND ME WE'RE TALKIN' BOUT
KIDS LOOK'IN AT ROCKS AND TREES, LEAVES AND BUGS, THINGS THAT FLY CRITTERS THAT CRAWL, SWIM AND JUMP AND
HOW WE HATE THE TOX-IC DUMP SO COME A-LONG AND SING THIS SO-NG
SING IT LOUD AND STR-ONG YOU WILL SEE YOU WILL SEE WE'LL MAKE OUR
EARTH A LIT-TLE GREEN-ER, OUR SKY A LIT-TLE CLEANER, YOU AND ME YOU AND ME.

"ENVIRONMENTAL EDUCATION"

Environmental education
It will save our nation
Wait and see
Wait and see

Kentucky is our land to care for
To save for those who follow
You and me
You and me

We're talking about kids looking at rocks and trees
Leaves and bugs
Things that fly
Critters that crawl,
Swim and jump
And how we hate the toxic dump

So come along and sing this song
Sing it loud and strong
You will see
You will see

We'll make our earth a little greener
Our sky a little cleaner
You and me
You and me

"Remember stone will crumble,
Dirt will loose
An avalanche of Dream
in tender spring
To bud and flower
into a luscious fruit...
Winter, this Dream
will not be anything.
Only your Dream
has value and can last."

Jesse Stuart

"And then to think each comes
and takes his turn.
Each man's a god
and each is crucified.
Each goes back to the dirt
and grass and fern
After the temple of his flesh
has died.
Each comes and goes
and each must go alone;
Each life is dirt
and time and rhyme and stone."

Jesse Stuart

"I do not understand
Infinite wisdom of this
workable plan
That everything is oneness
with the land,
When you are valley
and I am the land."

Jesse Stuart

"Americans have lost their
love for land.
Men have grown far away
from land and plows.
The greenback dollars
hold them in command."

Jesse Stuart

WORKSHEET A FROM "THE FRONTIERSMAN" REMOVED DUE TO COPYRIGHT RESTRICTIONS.

WORKSHEET B (Program I, Activity 2)

PRAIRIES

A typical prairie is a large area of level or slightly rolling land with generally deep fertile soil and tall grasses. Few trees grow on a true prairie. A hill prairie, on the other hand, is dominated by similar species but has thin, rocky soil and is generally found on steep hillside slopes.

WETLANDS

A wetland is an area in which the water table is at or near the soil surface, and standing water is typically present for at least some portion of the year. The characteristically saturated soils of a wetland support aquatic plants adapted to this wet environment. Bogs, marshes, and swamps are all examples of wetlands.

FORESTS

A forest is usually a large area containing closely spaced trees and underbrush. If the trees are mostly pines, the area is a pine forest; if oak, then it is an oak forest, etc.

CAVES

A cave is a natural underground chamber or passageway opening to the surface and formed by rock faulting, subsurface erosion, or subsurface dissolution of limestone or soluble rock.

RIVERS AND STREAMS

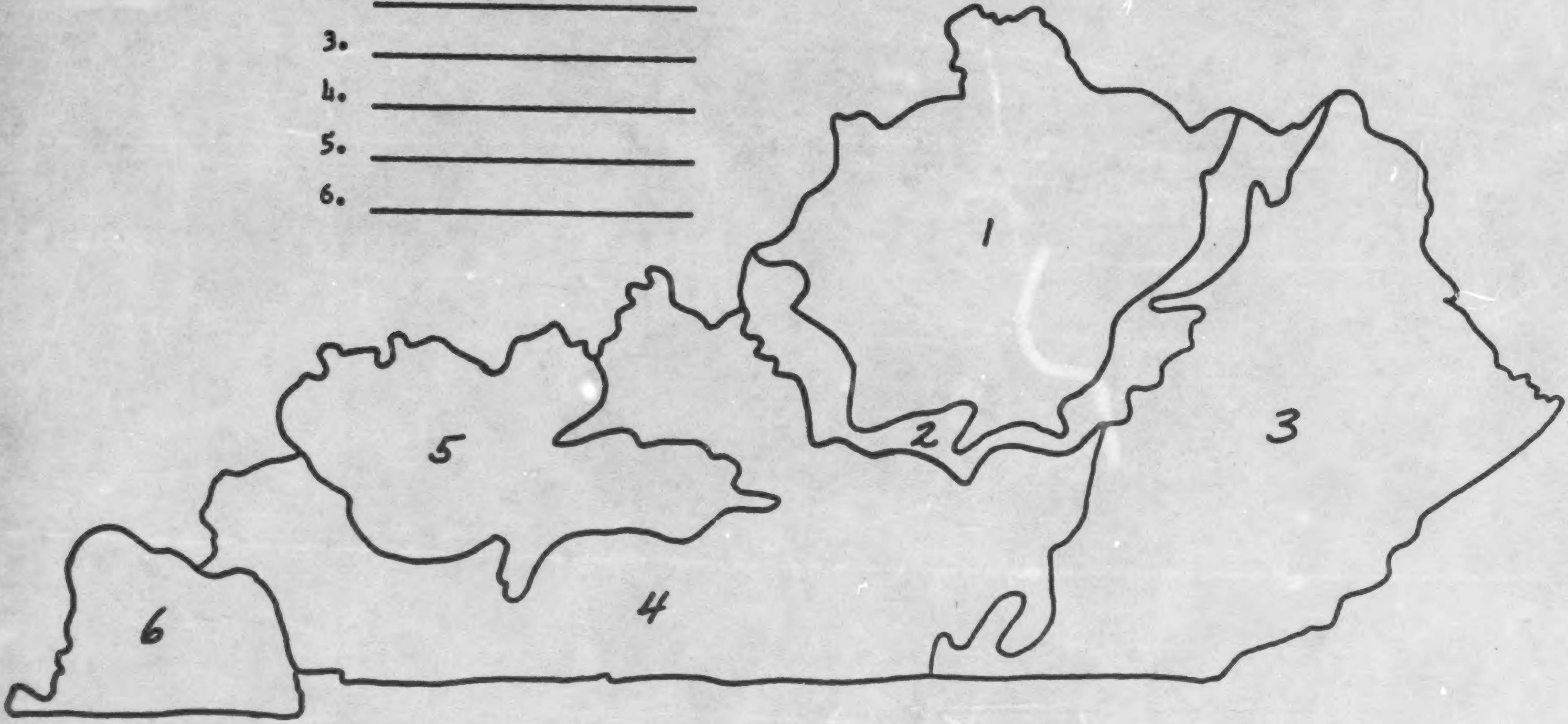
A stream is a body of running water flowing in or on the earth's surface. Streams may have a constant supply of water. Rivers, creeks, and branches are examples of streams.

WORKSHEET C

Match correct number of geographic region to the corresponding name. When you have finished, draw or write places in these regions where you might find prairies, wetlands, forests, caves, or rivers and streams.

REGIONS OF KENTUCKY

1. ____________________
2. ____________________
3. ____________________
4. ____________________
5. ____________________
6. ____________________



WORKSHEET D (Program I, Activity 4)

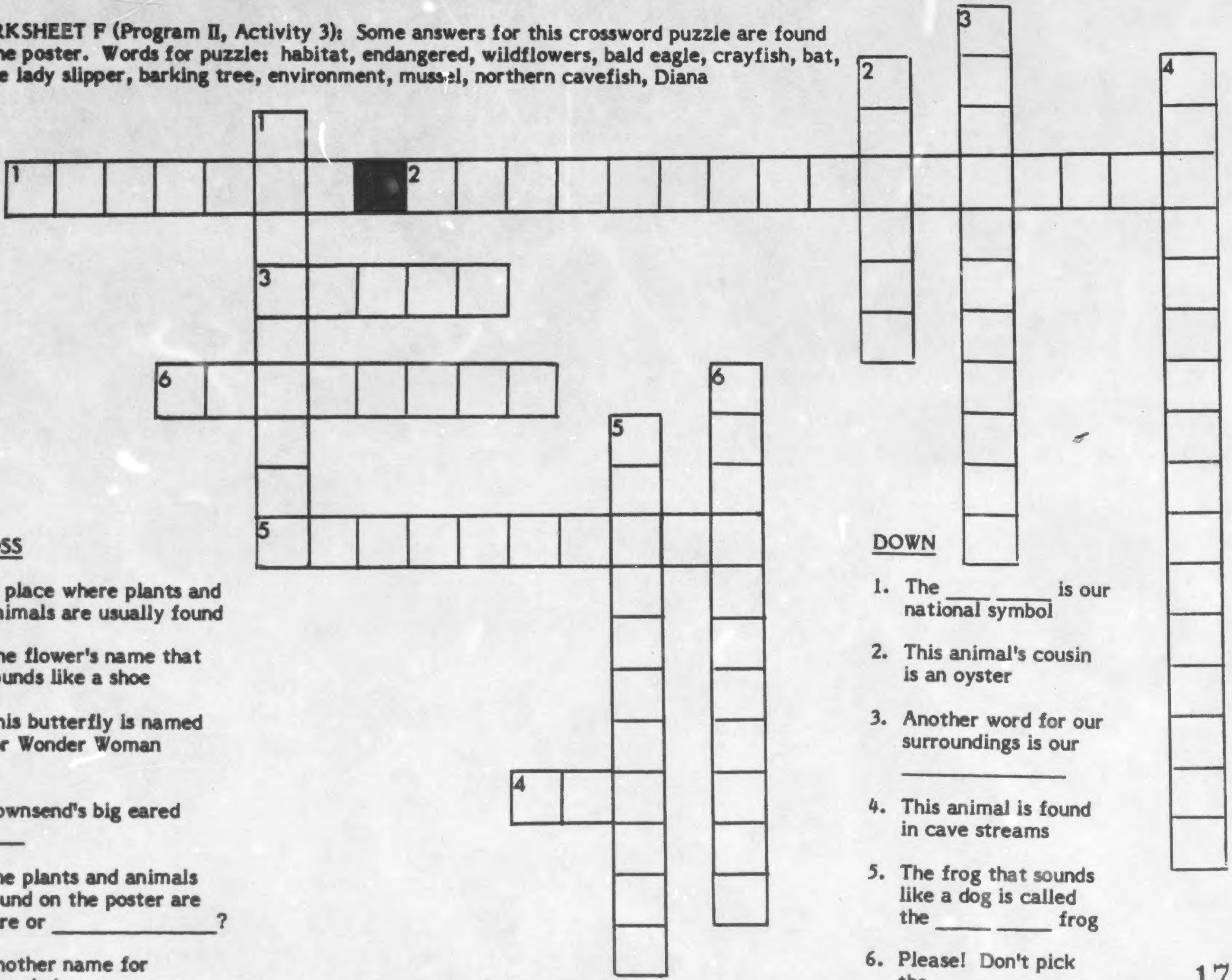
Recorded History of Kentucky - European/African Settlers

1976	Kentucky Nature Preserves Commission created
1972	Environmental education becomes a mandated program for Kentucky schools
1965	Kentucky celebrates 3 billionth ton of coal mined in the state
1962	Kentucky wins "Keep America Beautiful" Award
1937	Worst Ohio River flood in history
1924	First State Park established
1875	First Kentucky Derby
1862	Battle of Perryville
1832	First Railroad operated in Kentucky
1818	Jackson Purchase adds Western Kentucky
1811	Strong earthquake hits Kentucky; Reelfoot Lake is formed
1809	Abe Lincoln born near Hodgenville
1799	Mammoth Cave discovered
1792	Kentucky gains statehood
1778	Louisville founded
1777	Indian attacks leave Kentucky almost desolate
1776	Kentucky organized as a Virginia County
1769	Daniel Boone first visits Kentucky
1739	M. Longueil discovers Big Bone Lick
1654	Colonel Wood explores Kentucky

Cardinal Bond

WORKSHEET E "KENTUCKY THE STRANGE LAND" FROM SIMON KENTON REMOVED DUE TO COPYRIGHT RESTRICTIONS.

WORKSHEET F (Program II, Activity 3): Some answers for this crossword puzzle are found on the poster. Words for puzzle: habitat, endangered, wildflowers, bald eagle, crayfish, bat, white lady slipper, barking tree, environment, mussel, northern cavefish, Diana



ACROSS

1. A place where plants and animals are usually found

2. The flower's name that sounds like a shoe

3. This butterfly is named for Wonder Woman

4. Townsend's big eared ____

5. The plants and animals found on the poster are rare or ____________?

6. Another name for crawdad

DOWN

1. The ____ ____ is our national symbol

2. This animal's cousin is an oyster

3. Another word for our surroundings is our ____________

4. This animal is found in cave streams

5. The frog that sounds like a dog is called the ____ ____ frog

6. Please! Don't pick the ____________

WORKSHEET G (Program II, Activity 4)

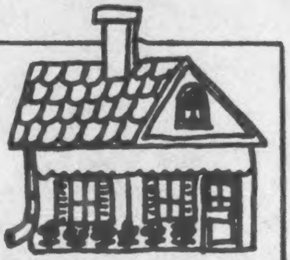
GLUT UNGLUT

A glut is someone who pollutes without thinking. Most of us are gluts at one time or another. Discuss glut-type behavior and ways to overcome it. Have small groups of students pantomine Mr. and Mrs. Average and their children in the following situations as they (1) show glut-type behavior and (2) choose a pollution-wise alternative. Make masks for the characters to wear or let them use puppets. The rest of the class guesses the activity in each scene. Encourage the students to think up new situations of their own.

Mrs. Average keeps her house very clean.

GLUT: She uses many paper towels.

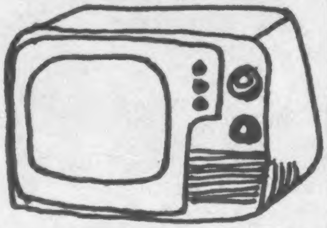
UNGLUT: She makes a rag bag and fills it with old clothes, towels, and sheets.



Sister Sue is watching television.

GLUT: She goes outside to play and leaves the television on.

UNGLUT: She remembers to turn the set off before she leaves the room.



Brother Ben is taking a shower.

GLUT: He uses gallons and gallons of water.

UNGLUT: He runs enough water to get wet, soaps his body, and turns the water on again to rinse off.

(Glut examples come from Fun With the Environment, a free publication of the Environmental Protection Agency, Washington, D.C. 20460. The suggested activity comes from Language Arts With An Environmental Twang, Miriam Litchfield, Center for Environmental Education, Murray State University.

WORKSHEET H (Program II, Activity 5)

The Walk

When we hike, not only will we move quitely but we will respect that invisible space that surrounds each person, being careful not to step on the heels of those in front of us. To the Indians silence was the giver of great powers and the "cornerstone to character". Like the Indians, we want to capture a reverence for silence by taking a soft walk - a walk where there will be no talking, our movements will be as soft as possible. When we see something interesting, instead of shouting "Look"! we will motion with sign language. We will end the walk with a sharing blanket.

Moving along the path we come to a pond where there are cattails. I motion for the group to gather around. I pull up a young shoot, peel off the outer sheath and take a bite of the tender inner shoot. I motion that it is good and invite others to taste it. Of course, you must be knowledgeable about which wild foods are edible and which are not. Then, I take a blade of the cattail and split it into 3 equal lengths with my thumb nail. I tie a knot at the end and place the knotted end in my mouth and braid it, making a headband, and place it on a student's head - all of this is done in silence. Moving along the trail I keep my eyes open for things to share such as some deer tracks to point out, which I do by placing my palms at side of my head with fingers extending outward.

Sharing Blanket

A small clearing in the forest can serve as the "sharing blanket". I motion that we form a circle and sit down. I share the interesting things I have collected on the walk, such as Jewelweed - whose seed pods pop open, throwing their seeds, when touched. I might have poke berries to use for painting noses, or the sleeping coccoon of a caterpiller. A special treat might include ripened persimmons and sassafrass tea and sumac ade with a sign language demonstration of how to make it. Of course, treasures gathered from the walk will change as the seasons change. I may pull from my basket the wing of a hawk, showing how it could be used as a fan, a hollow gourd to use as a dipper. I might have a basket made of honeysuckle vines filled with wild foods that are in season. I pass the objects around and when they are returned, I hoid up a clean paper plate, and begin to "paint" a picture on the plate with colorful flowers, berries, leaves and mud which I have collected. Upon completing this project, I begin to move around the circle and paint the children's faces with berries or mud. After this I return to my place. For the next five or ten minutes we sit still and listen to the sounds around us. Finally I break the silence by speaking. I explain that it is very difficult to break the silence, that whenever a group of people can come together and sit quietly and listen, it makes a very special kind of music. It's the music of the forest and of the fields. It's a kind of music that the Indians knew about long ago. It's called silence.

WORKSHEET H (continued)

I ask the children "What did you hear? Name one sound at a time. Was it music or was it noise? Most natural sounds, the wind in the trees, the birds, the crickets, all sound like music. The cars, jets, lawn mowers sound like noise. I ask "How do you suppose we sound to the animals, like music or noise"? Probably we sound like noise. Do you suppose that is why they run and hide when they hear humans coming through the woods? Perhaps we need to turn down our noise so that we too sound like the music of the forest and fields. And like the Indian, learn more of their secrets.

Optional Follow-up

1. Give each child a paper plate so that they too can collect "nature paints" and make their own picture.

2. For older children (6th grade and up) have them look for a natural object that symbolizes something within themselves, either how they relate to the land or to other people. Give them five minutes to silently find such an object and bring it back to the sharing blanket where they can share verbally with the others why they chose the object.

Suggestions:

After completing the soft walk you may wish to discuss the fact that the Indians knew that everything they had came from the earth. Discuss how everything we have comes from the earth as well, but that sometimes we forget because we obtain our needs from the store. How does this effect our "environmental consciousness"?

WORKSHEET I "THE ONCE AND FUTURE KING" REMOVED DUE TO COPYRIGHT RESTRICTIONS.

WORKSHEET J (Program III, Activity 3)

Nature Scavenger Hunt

Using a paper bag, go outside and try to find the following items!

Something blue

Something cool

Bird food

Something that makes soil

Something younger than you

Something dead

Something that tickles

A plant that hitches a ride (plant part)

The smallest bit of life that makes food from sunlight

A hiding place for a small animal

A color that captures the sun's energy

A nut

Pine needles

A small plant that floats on the water in a puddle or small pond

A decomposer

Something that shows a "glut" has been around

A fossil

Two different types of leaves

An insect

Something that smells good

Some of these suggestions are taken from Language Arts with an Environmental Twang, Miriam Litchfield.

WORKSHEET K (Program IV, Activity 1)

1) Who was your favorite character interviewed by the children in Thunder at Middle Ground?

Why did you like that character?

2) What is an environmental education center?

3) What is a fossil? How can a fossil help you learn about the past?

4) What is a solar home?

5) What is the "thunder at middle ground"?

6) What are some things you can do to help quiet the thunder?

7) What are some things your class can do to help quiet the thunder?

Kentucky's past conflicts often arose among Indian tribes over hunting rights. Land in the Bluegrass Region was so plentiful with wild animals that tribes fought each other for use of the land. What are some present day problems in Kentucky which deal with use of the land?

WORKSHEET L (Program IV, Activity 2)

It is the year 2081. You are director of a spacecraft from Earth and are planning a trip to the planet Eco in the Solar system of the second sun. Earth's resources are limited and abused and the purpose of your mission is to seek out new worlds for human colonization. Planet Eco was recently discovered by satellite probe. It has been identified as having conditions like those on Earth (oxygen, water, plants, animals, etc.).

As director of this important space flight, you are to choose five people to take with you to explore and colonize planet Eco. Thousands of people have applied to go on this trip and the computer has narrowed down this list to 9 people. It is up to you, the flight director, to choose the best five from that list. Because of the human abuse of the natural resources on Earth, you want to be sure to select the five people who would have the best survival skills to live on planet Eco, in addition to understanding the importance of using the resources in a re-usable and thoughtful way, a way which would not abuse planet Eco but would support the lives of the new human occupants.

Your difficult decision will be based on the limited knowledge you have of each person in the following descriptions. If you and the five people you choose live successfully on Planet Eco for ten years, more humans will be sent to establish a new civilization there. You and those you select will be establishing the "Law of the Land" for a new civilization.

1. Patti is the caretaker of animals and plants at a nature center. She has many years of experience in working with various people who come to visit the center. She develops and teaches programs to schools and other folks who want to come to the nature center to learn more about the cycles of nature. She has some knowledge about wild foods and plant identification and is well versed in first aid safety and survival skills in the out-of-doors.

2. Roger is a biologist. He has spent most of his life studying wild animals. This study has taken him into wild areas where he spends weeks in the out-of-doors living in a tent observing animals in their own habitat. He has special knowledge of animal behavior. He has written many books on animal and plant identification. Roger has traveled in various parts of the world to study different animals.

3. Mary is director of an Environmental Education Center. She spent part of her life living with various people studying their cultures. This included living with an Aboriginal tribe in the jungle. She has always enjoyed exploring new and different environments. She has a special interest in the study of rocks and fossils, which gives her clues and insight into the cycles of nature. She enjoys teaching children about the wonders of the land.

(More)

WORKSHEET L (continued)

4. Harry is an architect. He enjoys designing buildings and homes, especially ones which use solar energy principles. He has special knowledge on ways to build a house using natural materials and heating which use very little energy. One of his outside activities is membership in the Kentucky Corps of Longriflemen. This group uses primitive weapons, such as those used by frontiersmen, to hunt game and fish.

5. Maggie is an outdoor education teacher at an environmental education center. She is an avid hiker and canoe enthusiast. Maggie has special knowledge on ways to recycle various items. She can take almost any object, (man made or natural), and turn it into a useful tool.

6. Dee has special interest in law and decision making. On earth she works for the government and researches and writes laws for the legislature. Laws concerning energy conservation and solar use particularly concern her. Dee and her husband, Sam, also have built and live in an underground solar home.

7. Bud has spent his life studying the medicinal uses of wild plants which help to find new ways of curing disease. His knowledge of plants is also very useful in relieving pain and curing simple ailments. He enjoys cooking and can make a feast from wild plants found in his own backyard.

8. Hal is an organic farmer. He has learned how to grow foods in great quanitity without having to use harmful chemicals to control the insects. As an organic farmer, he recognizes the importance of utilizing waste material such as manure to make good soil.

9. Jim is an anthropologist. He studies the past histories of various cultures and how those cultures learned to live with the land. In addition, he runs an historical 1840's farm which demonstrates ways in which pioneers used to farm the land. By operating this farm, he has learned how to raise crops using primitive tools.

WORKSHEET M (Program IV, Activity 3)

OUTDOOR MANNERS

I AM AN OLD TIME COUNTRY LANE - just a plain dirt road with a lot of ups and downs, built by the pioneers who settled this region. I was abandoned, thank goodness, after those tin Lizzies began to honk and rattle thru the country. They didn't like me and I didn't like them.

For more than a century, people went this way on foot, on horseback, and in vehicles drawn by horses or mules. I became well acquainted with many of them and some of their great-grandchildren. They became acquainted with my trees, my wildflowers, my birds and all my wild creatures. In those days most folks were friendly, neighborly people. They had time to stop, visit, look and listen.

Now I'm used only by walkers. Scads of them come in May when the roadside thicket of hawthorns and crabapples are in bloom. Some are mainly interested in wildflowers or in watching birds. Mostly, though, they are hikers, groups of youngsters from camps, or families and picnicers out for a stroll.

Unfortunately, a lot of them do not have what I call good outdoor manners. Some are apparently strangers in the out-of-doors and don't know any better. Others must have had poor upbringing. Many are merely boisterous, careless, and remind me of a sign in a nearby picnic grove which expresses my feelings exactly:

Paper, garbage, broken glass,
Scattered here upon the grass,
Make a fellow scratch his dome
And wonder what you do at home.

I get mighty provoked sometimes, especially at the vandals who lop off branches laden with blossoms or, in autumn, with gaily colored leaves. I wish I could talk. I'd tell 'em what I heard a teacher tell her class on a field trip: "These forests are yours and mine too. They belong to all of us. If I damage or litter them, I am hurting your property. If you do that, you are hurting mine. Here we have a place in the country that the richest man does not have and could not buy. You should be proud of them, protect them, and use them wisely."

Too many people are what I call "scatterwalkers", They leave a trail of litter wherever they go. Nowadays almost everything comes wrapped in paper, cellophane or tinfoil, in handy little cans, or in bottles that never decay. Those, as well as Kleenex, are carelessly tossed aside.

I wish everybody had outdoor manners like a family that came sauntering along here last week and stopped for lunch beneath a big white oak. After the children gathered a lot of dead twigs, the man showed them how to build a small fire on a bare place in the road where they toasted wieners, buns and marshmallows. Using paper cups, they drank milk from two cartons carried in his knapsack. After burning the paper bags, cups and cartons, they carefully put the fire out and then, using a dead branch, swept the place where the fire was and even the grass where they sat, so that when they left, there was no trace of anyone being there. If you are that kind of people, come and see me sometime.

WORKSHEET N (Program IV, Activity 4)

Note to teacher: this pledge card can be cut out and pasted on a 3 x 5 card

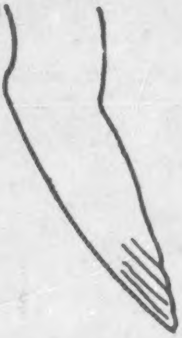
PLEDGE CARD

I, ____, a student at
____School
will pledge to do the following to help protect wildlife and Kentucky's natural resources:__________________________
____
____
for one month beginning:________________________________

I, (teacher or parent)__________________________________
certify that ____
completed the above pledge.

WORKSHEET O (For Which Parts Belongs to What)

a



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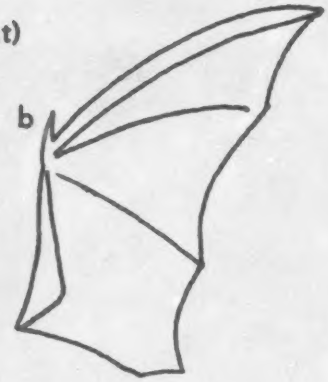

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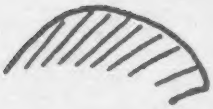

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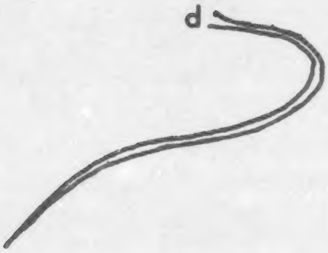

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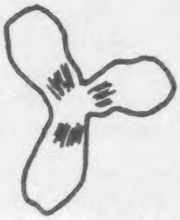

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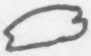

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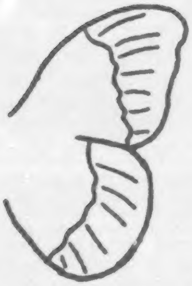

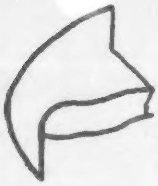

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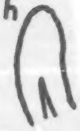

WORKSHEET P (for Seek and Find)

WORD SEARCH PUZZLE

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Q	O	S	O	D	H	G	B	A	L	D	E	A	G	L	E	I	S	U	H	N	J	R	A	H	M	K	N	I	U
H	U	M	R	A	P	I	N	K	T	U	R	T	L	E	H	E	A	D	S	Y	T	U	L	P	E	S	U	O	M
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U	I	H	O	M	Y	O	T	I	P	O	F	A	R	H	A	D	O	C	T	A	B	F	E	H	E	R	L	O	L
O	Q	D	A	S	L	E	V	P	B	N	I	V	A	K	A	S	N	N	E	P	R	A	P	N	Y	O	P	R	Y
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M	O	T	P	S	S	D	W	A	R	F	S	U	N	D	E	W	R	L	T	P	L	U	A	X	Q	O	H	K	A
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E	O	T	H	U	E	M	U	N	O	T	O	W	N	S	E	N	D	S	B	I	G	E	A	R	E	D	B	A	T

WORKSHEET Q (For Seek and Find)

COMMON NAMES OF POSTER SPECIES

Alligator Snapping Turtle
American Brook Lamprey
Ashy Darter
Bachman's Sparrow
Bald Eagle
Barking Treefrog
Blackside Dace
Copper Iris
Cumberland Bean Pearly Mussel
Daisy-leaf Grape Fern
Diana
Dwarf Sundew
Early Hairstreak
Four-toed Salamander
Fraser's Sedge
Grass-leaved Arrowhead
Least Tern
Long-tailed Shrew
Louisville Crayfish
Mountain Maple
Northern Cavefish
Northern White Cedar
Painted Trillium
Peregrine Falcon
Pink Turtlehead
Purple Fringed Orchid
Red Azalea
Red-cockaded Woodpecker
Scarlet Snake
Southern Twayblade
Townsend's Big-eared Bat
White Lady Slipper
Wild Rice
Woodland Jumping Mouse
Yellowish Gentian
Yellow-wood

KENTUCKY NATURE PRESERVES COMMISSION

proudly announces publication

of the

KENTUCKY NATURAL AREAS PLAN

This loose-leaf three volume publication represents an important addition to the knowledge of Kentucky's natural history. The Natural Areas Plan reflects the progress, to date, of the Commission's effort to identify Kentucky's natural areas and to protect our rich natural heritage. As the Commission's work continues, the Plan will be periodically updated, and the new information will be sent to all who have purchased the Plan.

The Plan includes:

**** an introduction to the Kentucky Natural Heritage Program.

**** a natural history section describing Kentucky's physiography, geology, climate, soils, vegetation, biogeography (flora and fauna), and major river basins.

**** a discussion of the Kentucky Nature Preserves System and the Natural Areas Register, complete with legislation.

**** an inventory list of approximately 350 areas and site descriptions for ninety-one potential natural areas.

**** individual species accounts including habitat, life history, distribution, and references for approximately 500 species of plants and animals currently monitored by the Commission.

**** classification systems for geological features and plant communities.

**** an extensive bibliography of literature references.

The Plan is a valuable reference to Kentucky's natural heritage and an important planning tool for development. It is available PREPAID for [redacted] per copy, which includes postage and handling.

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